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WIND POWER IN BRAZIL: A SUSTAINABLE ENERGY

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ABSTRACT
In this article we present the wind power as renewable energy and discuss the benefits and difficulties of its use in Brazil. It is an exploratory study since there are many studies on the technology of generating energy through wind, but there are little discussion about the benefits and impacts of its use applied to Brazil. Thus, to support the theoretical basis, we adopted the approach of survey and we seek in Science Direct all articles written -between 2007 until now in Europe to set up theoretical knowledge base. The data collection was made in other journals and websites to close the gaps of each topic and make a direct application to Brazil. Thus, this paper is a survey on the use and prospects of wind energy in Brazil. After a short theoretical introduction involving the issue of sustainable energy, our method was to describe the prospects for use in growth, benefits of using wind power and the need for appropriate policies, when considering its use in Brazil. We conclude that despite many difficulties today, the Brazilian government began to organize to take more consistent actions to promote the development of the promising wind sector.

KEY WORDS
Wind Power; Sustainable, Use in Brazil

1. INTRODUCTION

Even without knowing exactly what power is, the modern man and woman cannot live without its consumption. It is understood that electricity is a public commodity, though the service is sometimes managed by private sector. As public commodity, governments must protect the interests of citizens.

Energy has been defined as a force multiplier that enhances man's ability to convert raw materials into useful products, became a key infrastructural requirement of a country's economic activity. Energy provides an essential ingredient for almost all human activities: it provides services for cooking and space/water heating, lighting, health, food production and storage, education, mineral extraction, industrial production and transportation. [1]. Therefore, supplying energy under the safest conditions whilst offering the highest quality and the lowest costs is a vital objective within any energy policy (Ministerio de Economia *apud* [2]).

Energy sources can be classified as renewable or non-renewable sources. The most widely used has been the non-renewable, such fossil fuels, which also have been described as not too friendly to the environment, to provide energy services with emissions of both air pollutants and greenhouse gases. But the growing concern for the rise in fossil fuel prices, environmental degradation and the limited availability of the main sources has led to the world's interest in renewable energy sources such as solar, wind, biomass and geothermal. There are several definitions of clean energy, all of them involving individuals who attempt to advocate this or that ideology. However, there is no way to escape or forget the concepts of sustainability, involving principles of preservation of the environment, economy and equity proposed by McDonough and Braungart's model [3].

Under production management concepts, this model still cannot cover all the sectors of production. There are others subjects like supply chain and the production scale model, with productivity, efficiency and energy effectiveness that must be addressed. [4] [5] [6]. Electricity can be generated from energy provided by wind, water, sun, tides, fission or fusion processes, waste, sugar cane bagasse and even from the combustion of various chemical products. The biggest problems are the shortage of energy sources and the pursuit of clean generation, without causing environmental problems. Then a question is compulsory: Can electricity be generated without affecting the environment? No. Considering the triple parameters of equity (society), ecology and economy, it is possible to define the concept of clean energy as follows:

ENERGY = CONSUMPTION + LOSSES. *So when the losses tend to zero, we found the* ***CLEAN ENERGY****.*

There are other models of sustainability like "The cleaner production" but, in essence, all generation of sustainable energy is seeking to minimize the losses, whether (i) the quantity of waste, (ii) the impact on the environment; (iii)

financial cost or (iv) the impact of these residues on the society. In this case, the concept of "loss" does not necessarily follow the common definition of “trash”, as organic waste from hospitals or waste from a residential building. The scope of this concept it includes tangible and intangible sub products.

For example, the water reservoir for hydroelectric generation causes environmental losses with intangible financial value, because many ecosystems are flooded, animals and vegetation are affected. This loss biodiversity is a loss environmental. There are tangible and intangible losses in all power generation processes. We can apply this concept to decide on whether a power generation process is clean or not through these losses.

In this case we see that, in fact, the term "clean energy" could never be used alone, but an idea of comparative processes: Some energy generation processes can be cleaner than others, depending on the losses. At this point we can say that wind power is a clean and renewable energy, with the possibility of being the best form of generating electrical power.

In this paper, the energy of wind can be explained in physical terms, like that formed of air masses in motion. His recovery is done by converting the kinetic energy of translation, into kinetic energy of rotation. Turbines (known as aero generators) are used for the production of wind energy. Of course, there are still some problems. Locations with the best wind speeds sometimes coincide with migratory paths of birds. However, available statistics reveals that thousands of birds were killed by oil spills at sea. Visual pollution might detract from pristine views or hinder tourism.

Yet obstacles are present that limit wind’s utilization with respect to reserve capacity, operational back-up, wind speed forecasts, planning/installing offshore parks, network extensions, voltage and reactive power support, environmental impact and market prices. Besides, according to Güler [7], there has been a significant increase in electrical energy demand due to the economical and technological developments over the world. The global economy grew 3.3% per year over the past 30 years. In this period the electrical energy demand increased 3.6%. In order to supply the required electricity demand, thousands of new power plants had to be built (IEA apud [7]).

Currently, renewable energy sources (RES) supply 20% of the total world energy demand [8] and its development is growing significantly around the world, in part due to various governmental incentives, energy and environmental policies, and the increasing cost competitiveness of renewable energy technologies. In commercial and operational terms, wind power is considered as one of the most viable renewable energy sources. Therefore, it is emerging as one of the largest source in the renewable energy sector. Until the early 20th century, wind power was used to provide mechanical power to pump water or to grind grain, and that was the time when the first wind turbines for electricity generation were developed.

Wind energy is considered to be sustainable from an environmental point of view, where sustainability is defined as meeting society’s current needs without harming future generations [9]. Wind energy is one of the fastest growing energy systems in the world. During the last decade of the 20th century, worldwide wind capacity has been doubled approximately every 3 years.

Over the past ten years, global wind power capacity has continued to grow at an average cumulative rate of over 30%, and 2008 was another record year with more than 27 GW of new installations, bringing the total up to over 120 GW. The United States passed Germany to become the number one market in wind power, and China’s total capacity doubled for the fourth year in a row.

2. PROSPECTS FOR GROWTH IN USE

Global Wind Energy Council (GWEC) [10] predicts that in 2013, four years from now, global wind generating capacity will stand at 332 GW. During 2013, 56.3 GW of wind generating capacity will be added, more than double the annual market in 2008. The yearly growth rates during this period will average 22%, which is modest compared to an average increase of 28% over the last ten years. This development will be led by tremendous growth in China, and steady expansion in Europe and North America.

The surge in wind energy is due to a combination of many factors, including reduction in the cost of wind turbines, volatile and high prices for conventional forms of energy, the demand for non-carbon forms of energy to mitigate the effects of climate change, and favorable policies such as feed-in tariffs in Europe and renewable portfolio standards in the United States [11].

In EU, wind power continues to be one of the most popular electricity generating technologies. Since 2000, the installed wind capacity has increased almost seven-fold from 9.7 GW to 65 GW. The total capacity of new wind turbines installed across the European Union last year was 8,417MW, showing a decrease of 85MW compared with the total generated power in 2007.

To Changliang & Zhanfeng [12], while the market continues a steady drive forward within Europe and America, a major surge of activity has occurred on a global level. New markets are also opening up on other continents. In Pacific Region, New Zealand, which almost doubled its capacity in 2007 to reach 322 MW, has an excellent and largely untapped wind resources.

According to GWEC [10], wind energy today is becoming a global business, with its installations in over 70 countries and its role gradually expanding in global energy supply. However, the current global wind power market is mainly limited to a minority of countries [13]. Over 60% of the global market in 2008 was created by three countries — the USA (30.9%), Germany (6.2%) and

China (23.3%). 54.5% of the entire wind energy installed in the world is located in only three countries — the USA (20.8%), Germany (19.8%) and Spain (13.9%).

In 2007, there has been an increase of 935MW compared with the total in 2006, accounting for 43% of the total installed capacity and 73% of the annual market growth during 2007. Industry statistics compiled by the European Wind Energy Association (EWEA) show that cumulative wind capacity increased by 15% to reach a level of 64,949 MW, up from 56,535 MW at the end of 2007 [14].

According to aforementioned source, in the Americas, the US wind industry continued to grow at a record-breaking rate in 2008, installing 8,358 MW, an increase in generating capacity of 50% in a single calendar year. In 2007, the industry grew by 45%, adding 5,244 MW. The industry has grown an average of 32% annually for the past five years. Canada, with some of the world's best wind resources, is a promising market. In 2008, Canada became the 12th country in the world to surpass the 2,000 MW mark in installed wind energy capacity – ending the year with 2,369 MW. Canada's wind farms now produce enough power to meet almost 1% of Canada's electricity demand.

In Asia, China has made pronounced leaps in wind power capacity built up, and now it ranks fourth around the world, with 12.210MW by the end of 2008. With regard to Africa, Egypt, the most successful country in Africa, is supported by sustained government commitment and fruitful international cooperation, it has passed the stage of initial resource assessment and demonstration projects towards the planning and implementation of large scale grid connected projects. From a current level of 365 MW, the Egyptian government is looking for the country to install 850MW by 2010 [10].

This point is interesting to note in the table below, which shows the status of wind power deployment around the world.

GERMANY remains Europe's largest wind energy market and during 2008, 866 new wind turbines with a capacity of 1,665 MW were installed in Germany, bringing the total up to 23,903 MW [10]. "Wind development has consisted of wind turbines that are widely distributed, taking advantage of the geographic dispersion of wind resources and providing some smoothing of wind's variability" [15]. In a typical wind year, 6% of Germany's energy demand can be provided by wind farms, and 45mi people are employed by wind energy industry in Germany [7].

SPAIN is the world's third largest wind energy market, with 16,754 MW of total installed capacity and new installations in 2008 totaled 1,609 MW. The Spanish market has been growing consistently and intends to achieve the government's 2010 target of 20 GW of installed wind capacity. In 2008, wind energy produced more than 31TWh, providing more than 11% of the country's electricity demand [10]. "To Perez &Ramos [16] the success of wind energy is explained by certain specific characteristics of the FIT mechanism, which allow for an understanding of the model's operation and its credibility.

ITALY The Italian wind energy sector presented significant growth in 2008. 1.010 MW were installed in 2008, reaching 3,736 MW of cumulative installed wind power capacity and a corresponding electricity production of more than 6 TWh which represents about 2% of the country's total electricity demand. According to the Italian Wind Energy Association (ANEV), 16,200 MW of wind energy could be installed by 2020, producing an additional 27 TWh of electricity [10].

DENMARK according to Sovacool [17] just to list some of the most important milestones in energy policy, Denmark has to depend on for 99 percent of foreign energy sources such as oil and coal in 1970 to become an exporter of natural gas, petroleum, electricity today. Denmark is the first in the world in terms of having the largest portfolio of wind projects integrated to its power network (21.6 % in 2006) and is the world leader in wind technology, exporting US $7.45 billion in technology and equipment in 2005, approximately 8 percent of total Danish exports and one third of the total world market.

TURKEY has a large potential for renewable energies, and one of the best renewable energy sources is wind energy [18]. "The installed wind capacity of Turkey is only 0.22% of its total wind potential. However this rate will be increased to 14.27% after installing the licensed projects. It is possible to improve the present wind energy capacity to the European countries' levels by increasing government supports, constituting necessary technological background to connect to the interconnected network" [7].

USA Till the early 1980s, the US possessed 95% of the world's wind energy installed capacity. In US, the cost of wind-generated electricity has fallen from 35b/kWh in the mid-1980s to 4b/kWh at prime wind sites in 2001 and the wind-generating capacity is growing by leaps and bounds. On the border between Oregon and Washington the world's largest wind farm with 300MW installed capacity is being built. US total installed wind capacity is now more than 25,170 MW, producing enough electricity to power nearly 7 million homes and to meet over 1% of total electricity demand. [10]

CANADA Wind energy systems have been considered for Canada's remote communities in order to reduce their costs and dependence on diesel fuel to generate electricity." High penetration of wind-diesel system has the advantage of increasing economies of scale, and replaces significant quantities of diesel fuel, but has the disadvantage of not being able to capture all the energy that is generated when the wind turbines operate at rated capacity... In such cases, the energy storage system can allow additional production of 50% of electricity from wind turbines [19]

CHINA Wind energy in China had a record level of growth recently, and has doubled its total capacity every year since 2004, although the geographical distribution of resources does not encourage the wind load profile of the country's energy. This expansion is vital because of China present insufficiency of energy resources in the long term and an increase in demand for energy caused by strong economic growth [12].

INDIA To Mabel & Fernandez [20], in India, the wind power generation has gained a high level of attention and acceptability compared to other renewable energy sources. New technological developments in wind power design have cooperated for the significant progress in wind energy penetration and to achieve optimum power from available wind. According to the projections made by MNRE (Ministry of New and Renewable Energy), 10% of the total capacity of power generation will come from renewable energy sources by the year 2012.

PAKISTAN has undoubtedly significant potential for harnessing wind energy but it has so far not been utilized significantly. There was a lack of reliable and complete data on wind resources until very recently. Small-scale applications include water pumping and providing electric power to remote off-grid communities. Large grid-connected wind farms can help alleviating power shortages in general and then the living standard and environment quality will improve with the development of wind energy resource. But for this, well-organized and concerted efforts need to be made by the government to promote the use of wind energy and to educate people about its associated benefits [1].

NIGERIA The utility of wind as a resource for power generation in Nigeria is gaining ground and attracting government's attention. It was discovered that the mountainous regions and different places of the central and south-eastern states were identified as good areas for wind harvest together with offshore areas bounded by the Atlantic Ocean and running from the south–west coast through south–east to the south–south have great potential for wind energy cultivation for power generation. Also, the interchangeability in the period of availability of wind energy and hydropower source makes wind energy a good compliment for power generation, promoting at least a decrease in the energy crisis [21]. Analysis of the Borno State concluded that there is good perspective for wind energy utilization because the wind speed is high enough to support wind power generation and supply [22].

ETHIOPIA It is well known that Ethiopia has been suffering from cyclical droughts, which hamper the sustainability of the agro-ecological environment. As in most developing countries. As a result, a dependence on wood and agricultural wastes for fuel has inevitably led to deforestation and desertification due to the lack of re-plantation and soil rehabilitation schemes. The results obtained in this study for the selected sites (Addis Ababa, Mekele, Nazret and Debrezeit) show that, in general, although the potential may not be sufficient for independent wind energy conversion systems, it is believed that wind energy is feasible if integrated into other energy conversion systems such as PV, diesel generator and battery [23].

ALGERIA Solar and wind energy are the most abundant natural resource in Algeria. It becomes imperative for Algeria to exploit this important energy resource. Recently, were limited due to the high costs and the need for advances in technology. to the growth of generating capacity of wind power is needed at the moment, invest in education and introduce a special law of energy. Algeria hopes to increase these sources in the country's electricity mix to 10% by 2010 [8].

TUNISIA is one of the Mediterranean countries having windy enough areas, manly along the coasts. During the past years, it has started wind energy programs and its socioeconomic development has contributed to the acceleration of the rate of the power consumption. Then, the wind energy sector became a promising source in the improvement of the energy balance. The national objective is to reach 100MW by 2009 [24].

SUDAN Due the imminent exhaustion of fossil energy resources and the increasing demand for energy, Sudan to put into practice an energy policy based on rational use of energy; and on exploitation of new, and renewable energy sources. After 1980, a renewed interest for the application of wind energy has shown in many places then the Sudanese government began to pay more attention in its utilization, however only in rural areas, where will be spread wind pumps due the attractive wind energy resource. It is concluded that Sudan has wind in abundance [25].

AUSTRALIA has some of the world's best wind resources, and benefits from a stable, growing economy and good access to grid infrastructure that can potentially accommodate up to 8000MW of wind energy with minor adjustments. After some years of slow growth in Australia's wind market, the speed of development increased again in 2008, with 482 MW of new installations, a 58% leap in terms of total installed capacity. Australia has now 50 wind farms, with a total capacity of 1,306 GW [10].

NEW ZEALAND government's new policy targets for renewable energy may be technically achievable, but have a strong resistance of the population for the development of new energy which can avoid the success of these aspirations. The research revealed that a large number of factors relating to the site, the physical aspects of the wind farm, the political and institutional context, socio-economic aspects, social processes, local and personal issues, and environmental impacts can all contribute to a person's ultimate views as to whether they support or oppose a wind farm proposal. [26].

In Brazil, "The Alternative Energy Sources Incentive Program (PROINFA) was created by Law 10,438, in 2000. It was designed to stimulate the electricity

generation from three energy sources (wind, biomass and small-scale hydropower plants). The Program was divided into two phases. The first one uses feed-in tariffs for promoting the development of 3300MW. The second one that was originally based on feed-in tariffs was modified in 2003, in order to be based on biddings for renewable.

The first computerized instruments and special sensors to measure the wind power were installed in Ceará and Fernando de Noronha (PE) in 1990. Data from the Brazilian Wind Atlas reveal that the wind power potential is of the magnitude of 143 GW (272.2 TWh/year) and that 769 MW are planned for installation. Currently, the 15 plants in operation have installed capacity to generate only 236.8 MW. Areas with highest wind power potential are found in the Northeast, South and Southeast [27].

Due to this bound, the highest-cost power option promoted by PROINFA (wind power generation) might have development problems." To solve these problems and keep the original aims and targets of the Program, which is to diversify the energy matrix, an alternative option could be biddings for renewable according to specific criteria (industrial and technological development and cost), based not only on their cost- effectiveness [28].

3. BENEFITS OF USING WIND POWER

3.1 Employment opportunities and income growth

Wind applications in rural areas have a significant impact, not only creating new jobs, but improving community income through local and state taxes and through land revenues, which can then be used to fund social services [14]. In 2008, the wind industry worldwide invested more than € 36.5 billion, and the sector is employing well over 400.000 workers. The estimated annual value of global investment in wind energy will reach € 149.4 billion in 2020 and account for more than 2.2 million jobs [10].

In 2007, employment in wind energy in the EU reached 154.000 people, and in 2020 this number will be more than double to reach almost 330.000 people (Fig 1). Onshore wind energy will remain the largest contributor to employment throughout the period, but in 2025, employment in offshore wind energy will exceed onshore employment. In 2030, more than 160.000 onshore and offshore 215.000 people will be employed in Europe [14].

From the same source, it is estimated that 84,300 jobs are in the wind power sector (Federal Ministry of the Environment, BMU 2006 and 2008). In Spain, wind energy employs a total of 37.730. In Denmark, however, 23.500 jobs are coming from the workshop industry [29].

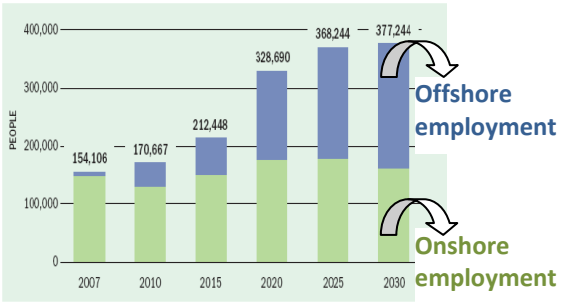

Fig 1 - Wind energy sector employment (EU 2007-2030) - Source: [14]

Wind energy also has the advantage that it can be deployed more quickly than other energy supply technologies. Building a conventional power plant can take 10 or 12 years or more, and it will not produce power until it is fully completed. Wind power deployment is measured in months, and a half completed wind farm is just a smaller power plant and can start producing power and income as soon as the first turbine is connected to the grid [10].

Even large offshore wind farms, which do not need a greater level of infrastructure and grid network connection, can be installed from start to completion in less than two years, a crucial ruff given the pressing threat of climate change [10]. Besides these advantages, wind farms have positive environmental impacts discussed below)and wind systems operations do not generate air emissions or pollute water streams and do not produce hazardous waste. Wind's pollution-free electricity can help reduce the environmental damage caused by power generation in the world [29]. Every kWh generated by wind power has the potential to replace fossil fuel imports and to improve both security of supply and the national balance of payments. This is an even larger issue for poor countries in Africa, Asia and South America whose economies have been devastated by recent oil price hikes [10].

3.2 Beware of the environment

According Himri [10] most scientists now agree that global climate change induced by man poses a serious threat to society and ecosystems on Earth. Renewable energy deployment is the key to future prosperity based on healthy global environment. It is considered a promising way to mitigate environmental pollution problems such as major environmental accidents, water pollution, marine pollution, radiation and radioactivity, solid waste disposal, hazardous air pollutants, ambient air quality (CO, CO_2, SOx, NOx effluent gas emissions), acid rain, stratospheric ozone depletion and global warming.

Also the wind energy is the only power generation technology that can deliver the necessary reductions in CO_2 in the critical period until 2020, when the greenhouse effect will reach its peak and begin to have its intensity reduced to avoid dangerous climate change [10]. It is

unclear whether offshore turbines would have higher or lower production of CO_2 per MW construction. In general, transport by ship is more efficient than over land, but the operation and maintenance emissions may be higher for offshore wind. Assuming an offshore wind turbine replacing the production of electricity from fossil sources, at a rate equal to onshore wind farms, then, each MW of wind capacity should replace about 1.800 tons of CO_2 per year [30].

According to GWEC [10], the CO_2 savings generated by the wind energy have significant economic and environmental effects. If we put a dollar value on the ecological services, in terms of unused water and reduced carbon emissions by using wind energy relative to traditional fossil-fueled power. The actual costs to offsetting a ton of carbon are not known, but governments have developed trading systems in which offsets are traded. The costs of these offsets will be determined by supply and demand, and are expected to increase in the future. Current prices for the offset of one ton of CO_2 are about $30.

Each MWh of coal-fired electricity produces 0.839 tons of CO_2 [30]. Thus, per MWh, the value of avoided CO_2 emissions could be about $ 25. The calculations show that, in 2000, a total production of around 15 million tons of CO_2 was avoided across 28 European countries, through wind energy generation [22]. In 2008, the 120.8 GW of wind energy capacity worldwide will produce 260 TWh and save 158 million tons of CO_2 every year [10].

Economic savings through execution of wind power may be calculated by comparing its external costs with those of fossil fuel technologies, and relating these costs to the proportion of fossil fuel generation capacity displaced by penetration of wind technology. Total avoided external costs through the use of wind power reached to nearly N288 billion in 2000. In 2020, wind energy projections is estimated at 425 TWh/yr and the external costs reduction would be up to N4 trillion in that year alone [22]. In 2020, 180 GW of installed wind energy would economize Europe by €8.2 billion a year in CO_2 costs reduction [14].

3.3 Possible combination with other energy sources

According to Kassem [31], professor of Royal Institute of Technology in Stockholm - Sweden, "Wind Power is a way to produce cheap energy, without harming the environment. Although not yet a source of enough production to satisfy most of the demand, wind energy can be perfectly combined with other energy systems, such as solar and/or small hydro power plants. The excess electric power can be used to pump water to the reservoir during periods of decreasing consumption.

The most favorable applications of wind energy in Brazil are in the integration to the system of large blocks of generation on the sites of greatest potential. In some areas, such as the Northeast region, in the valley of the São Francisco river, can be seen a situation of complementarily to the wind generation with hydrological period, either in seasonal period or in the generation of peak system.

In other words, for the wind profile observed in the dry season, the Brazilian electrical system has greater capacity to generate electricity precisely when the affluence of hydroelectric reservoirs is reduced. Moreover, during the wet season the Brazilian electrical system, characterized by the major filling of the reservoirs, the potential for wind generation of electricity is smaller. Thus, the wind energy presents itself as an interesting alternative to complement the national electric system [32].

3.4 Facility of Decentralization Energy

The modern renewable energy offers, as a main advantage, the option of energy system decentralization. The wind energy generation can be assigned by the government to sites with greatest specific wind potential to create initiatives and jobs in both rural areas and in poor urban areas, and expanding the population's access to public service of electric energy. This expansion of access to power is based on local generation and supply of electricity on a smaller scale, eliminating the need for construction of extensive transmission and distribution networks to carry out the electrical service. For this reason, decentralization can help raise the rates of electric service in Pará [33].

Brazil needs to diversify its energy matrix (wind, solar, biomass and hydro) In order to have easy access to small-scale decentralized power technology, which is an important element for success in reducing poverty, improving living conditions, While improving the workforce utilization and the economic wealth distribution, thus offering the prospect of offering the prospect of a future scenario with social equality, preservation of nature and reducing pollution.

4. NEED FOR APPROPRIATE POLICIES

According to Associação Brasileira de Energia Eólica (ABEEólica) Brazil still needs a clear long-term policy for wind generation, showing a horizon of business for the energy source in order to consolidate the market share of national energy. For the specialist Perrelli (ABEEólica) was by this path that other countries have attracted investments and the wind source, such as China, India and European countries. In Sweden, for example, there are many tax and imposts in power generation of electricity by sources not right environmental. “The energy taxation policy is aimed at improving the efficiency of energy use and encouraging the use of biofuels and wind power, creating incentives for companies to reduce their environmental impact” [34], In addition there is the emit and sale Green Electricity Certificates, among other sources, focusing the increase use of wind power

In Brazil, after PROINFA the auction restricted to wind power projects scheduled for the second half of this year are mentioned as an alternative to stimulate the wind

power generation in the country. According to Feitosa, vice president of the World Wind Energy Association (WWEA), after confirmation of the completion of the auction for sale of wind electricity, many international companies began to look to Brazil as the destination of its subsidiaries, making the Brazilian wind industry more competitive. According to the aforementioned manager, with the high price of oil and world concerns with the environment, the Brazilian government should take serious steps to impose targets to include two thousand MW of wind energy per year in the country.

In a meeting in Brasilia, the federal government and 18 states agreed to deploy a plan to develop the national wind farms. The project was called “Carta dos Ventos” (Letter of Wind). Among the measures that will comprise the "letter" are the simplification of environmental licensing, the flexibility index of nationalization (since there are no production of equipments in the country), tax exemption, evaluation studies of wind potential and stimulus to demand, via annual auctions of energy. Wind energy is clean, but on the other hand, is still expensive and its output small, so need incentives.

5. CONCLUSION

In the last five years, the total installed wind capacity is growing increasingly year after year, reaching a growth of over 28% in 2008, when it reached the mark of 120GW. Despite the economic recession the GWEC forecasts indicate a growth rate of annual average of 22% over the next five years.

Wind energy is a renewable energy but not sustainable yet, because there isn’t sufficient production volume for industrial applications, for example.

The high cost of generation is a major barrier that prevents the spread of decentralized electric service, one of the main advantages of modern renewable energy. The small-scale generation, the reduced demand, the low level of technological development of some energy alternatives and the minor market share tend to increase the cost of decentralized electric service.

Therefore we grant is an essential mechanism for reducing the cost of electric service. Wind energy needs of government tax incentives, subsidies, to boost the wind market, so the industry can develop the technology for manufacture, hire consultants to train employees, buy raw materials with advantageous prices, and produce (towers, generators, turbines, blades) on a more rational way, with quality, efficiency, and reducing expenses. Then it’s just a matter of scale factor: the measure that increases the production is lowering the cost of energy. With this, the medium and long term, the wind industry should have cost attractive and will help in the formation of the productive chain.

Even there are problems with respect to the establishment of a government policy of the long-term prospect for the integration of wind source in the energy matrix, defining a level of MW to be hired by auctions and the conduct of specific auctions of wind source to meet the demands of the distributors partially. Probably soon this situation will be resolved through the "Charter of the Winds."

There is also little environmental problems, for the large-scale deployment, for example, CO_2 emission, in small amounts, in the manufacture and installation of wind towers and noise caused by the rotor, which can generate complaints especially when installed in rural areas. It’s estimated that half of the Northeast wind potential (144.3 TWh / year) is located in Permanent Preservation Areas (PPAs), depending on the existence of dunes.

The installation of wind turbines on towers imposes the necessity of adopting of care to avoid problems arising from the weakness of land. Still, one should consider the need for previous studies with respect to the migration routes of birds in order to prevent the wind turbines are barriers to migration of the same [27].

However it is worth to note that the technological advances seen in the use of new materials for blades and through its better aerodynamics, and the use of materials more resistant and lighter in the tower, and the new processes for manufacturing of it, among other events are increasing the power and life of the wind towers, and then perhaps in 10 or 15 years there is the possibility of been renewable and is becoming sustainable.

And in Brazil we find a growing chain of production, becoming prominent in the export of parts, components and parts of components; and in 2009 must have doubled its installed capacity.

The largest supplier of blade in the United States, country of higher wind energy installed capacity, is a Brazilian company, located in Sorocaba-SP. An executive of the Brazilian Association of Wind Energy says that Brazil has (from a base and heavy industry) exported many components of aero generators, to the market - the largest and most competitive - the United States.

In Brazil, there is enough wind in several regions of the country. However, there is a great lack of real incentives. Then, actually:

1) The cost of production is still high, if compared to hydro power;

2) There are not manufacturers of turbines or it have not conditions for importation;

3) The regulation is extremely difficult for energy policy demands by ANEEL (agency regulatory);

Thus, we can conclude that, in Brazil, despite being considered a clean energy, wind power is still only a promise of sustainable energy. There are many issues not resolved like regulatory issues, supply of chaim and economic leverage to a greater use.

Finally, now we can say only: Wind energy is a promising future.

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