Scenarios for an efficient, safe and competitive electric sector[1]

WWF-Brazil[2]

In September of last year, the WWF-Brazil organization disclosed a study called "Sustainable Power Agenda 2020", which examined the paths and the challenges for energy production in Brazil. That analysis became even more relevant because, in December 2005, the government started to adopt some decisions that neglected the "clean" image of its energy matrix. That happened because, at that time, 70% of the available energy was sold to fossil fuel thermal power plants (such as diesel oil,

coal and natural gas), adding up to a total of 3,286 MW (megawatt) – which represents a 2.8% increase on the total carbon dioxide emissions in Brazil, and an 11% increase on the total CO emissions of the electric sector.

For that reason, WWF-Brazil concluded that "the choices that will be made in the Brazilian electricity sector in the next 15 years will be crucial to the national energy security, to the economic and social development and to the environmental protection of the country". It also emphasized that Brazil is a reference in the international negotiations concerning renewable energy sources and climate change. However, if the decisions made about the electric sector are mistaken, they can lead the country to position itself on the opposite direction of global agreements and efforts, such as the Kyoto Protocol. Thus,

> in partnership with a coalition of associations of clean energy producers and traders, as well as environmental and consumer groups, WWF-Brazil commissioned a study to researchers from Unicamp – the State University of Campinas and from *International Energy Initiative*. The result presented is an ambitious yet realist analysis of the Brazilian energy potential to supply, in a manner that is less harmful and less dependent on carbon, Brazilian electric needs until 2020. That study is part of the international initiative called "PowerSwitch" that the WWF network is implementing in more than 16 countries.
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> At the preface of that document, Professor José Goldemberg stated:
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> This publication – which is the result of the compromise and effort of an innovating coalition of environmental groups, of consumers and of the industry, lead by WWF-Brazil – is an important contribution for the Brazilian debate on energy and climate security. The study shows that, with a policy that is more aggressive in efficiency and with the implementation of more

renewable energy sources, such as biomass and wind power, Brazil can increase its energy security and create millions of jobs, while contributing with the global efforts against climate changes.

This study also presents a concrete proposal for future reductions of sectoral emissions, which Brazil could take into account in a context of future actions'negotiations concerning the climate. That`s the kind of proposal that Brazil needs to keep and to reaffirm its leadership in the fight against climate changes.

Characteristics of the proposal

Denise Hamu, who is the Secretary-general of WWF-Brazil, synthesized the study in the following manner.

The study compares two scenarios: one of them follows the current trends, the Business-as-usual one, while the other one aims at sustainability, the PowerSwitch scenario. They both take for granted the same growth hypotheses and the same socioeconomic conditions of the population. However, their difference has to do with the energy models adopted, since the PowerSwitch scenario predicts more aggressive planning policies, a greater efficiency in energy generation and transmission, as well as consumption rationality and a greater use of renewable sources for electricity production.

If Brazil applies the PowerSwitch scenario along with the energy efficiency measures, in 2020 the expected energy demand will decrease by as much as 40%. In practical terms, that energy is equivalent to the avoided generation of sixty nuclear plants the same size as Angra III, fourteen Belo Monte hydroelectric plants or six Itaipu hydroelectric plants. That represents a saving of as much as R$ 33 billion in the national electric bill until 2020, which directly affects the Brazilian citizen's pocket. Besides, the planned flooded area to build the hydroelectric plants' reservoirs will be reduced seven times, which will decrease the impacts on both the traditional populations and on the national biodiversity.

The PowerSwitch scenario is excellent to the Brazilian economy since it will generate eight million new jobs, with the electricity generation through renewable sources, such as biomass, wind, solar and small hydroelectric plants. They will be responsible for 20% of the total electricity generation in Brazil, which will ensure the stabilization of both the carbon dioxide and the nitrogen oxide emissions, which are the main greenhouse gases, in a level close to that of 2004. The PowerSwitch scenario could reduce 413 million tons of CO2 accumulated between 2004-2020, surpassing the 403 million tons of CO that the Pro-álcool Program was able to avoid between 1975 and 2000.

It is through that collective effort that WWF-Brazil and its partners want to demonstrate that Brazil can indeed get to 2020 with more jobs, more clean and sustainable technologies, more savings for the citizens and with a

cleaner energy matrix. At the same time, social and environmental impacts and energetic risks in the form of new blackouts will be considerably minimized.

Executive summary

Based on those justifications and presuppositions, WWF-Brazil makes a synthesis of its proposal as follows.

That study seeks to explore a scenario for the Brazilian electric sector until 2020, so as to fulfill several political goals, such as the increase on the electricity supply safety, the development of technological innovations, cost reduction for the final consumers, the creation of jobs and the reduction of social and environmental impacts. That sustainability scenario can be reached through the use of aggressive energetic planning policies intended to promote a greater energy efficiency and the greater use of renewable sources for electricity generation. The authors call that scenario Business-as-usual. For reference sake, another scenario, called Business-as-usual, was also developed. It seeks to represent the evolution of the electric sector according to the official projections available in Brazil.

The PowerSwitch scenario demonstrates the increase potential of the electric sector`s efficiency and the possibility to double the share of renewable sources (biomass, wind power, Small Hydroelectric Centers (PCH), as well as thermal solar and photovoltaic), as compared to the Business-as-usual scenario, reducing the energy expenses by almost 40% of the electricity needs in 2020. That is possible through a combined effort to reduce consumption and to promote the rational use of electricity and through the more expressive introduction of renewable sources substituting fossil ones to generate electricity. Greater energy efficiency, mainly from the demand side, is a key strategy to permit resource saving and to make a substitution of fossil sources and the end of the construction of large hydroelectric plants possible.

The PowerSwitch scenario presents a reduction of the installed capacity expansion's growth rate for electricity generation. While the Business-as-usual scenario requires 204 thousand megawatts (MW) of installed capacity (or a growth of approximately 5% per year, between 2004 and 2020), the PowerSwitch scenario requires a total capacity of 126 thousand MW (a growth of 2% per year in the same period). The estimated savings represent the electricity saved in 2020, which is the equivalent to approximately 75% of the total consumption in 2004. The share of fossil sources for electricity generation that, in 2004, represented 19% of the installed capacity in Brazil in the Business-as-usual scenario reaches 24% of the capacity in 2020. However, the PowerSwitch scenario proposes its reduction to 14% of the total installed capacity foreseen.

The PowerSwitch scenario doesn`t need to be more expensive than the Business-as-usual one. Even considering additional expenses for the greater share of renewable sources (that even in 2020 are expected to be more

expensive than the conventional sources), the PowerSwitch scenario allows for a 12% saving of expenses for the fulfillment of the energy services through energy efficiency measures. That represents almost R$ 33 billion that are not spent until 2020 to generate, transmit and distribute electricity in Brazil.

Through the reduction of the energy waste and the greater share of new renewable sources, that scenario will avoid the implantation of more than 78 thousand MW in the national electric system, which would be equivalent to approximately sixty Angra III, or fourteen Belo Monte, or six Itaipu plants, or seven times the installed capacity aimed by the Ten-Year Expansion Plan for 2006-2015 for the Amazon region. Therefore, the potential social and environmental conflicts related to hydroelectricity expansion in the Amazon region will be reduced.

Important additional benefits derive from that PowerSwitch scenario as far as the creation of jobs, the biodiversity preservation and the pollutant emissions reduction are concerned. Considering only the opportunities for the greater utilization of the renewable sources, it can be estimated that some four million new direct and indirect jobs will be added to those already associated to the Business-as-usual scenario, for a total of eight million new jobs created in the PowerSwitch scenario. That figure does not include new jobs, both direct and indirect, that might certainly materialize through greater investments in energy efficiency.

The reduction of the hydroelectric plants' expansion in the PowerSwitch scenario results in the decrease of the necessary area for reservoirs, reducing the impacts on biodiversity. Although flooded area calculations are extremely dependent on the geographical location and on the size of the ventures, we estimate that the expansion associated to the PowerSwitch scenario brings about a flooded area which is seven times smaller than the necessary one for the hydroelectric plants and the PCH installed capacity of the Business-as-usual scenario.

The CO2 emissions get almost stabilized at the 20 million tons of carbon dioxide (CO2) range. The nitrogen oxide (NOx) emissions could be reduced from seven million in 2004 to 5.5 million tons of NOx in 2020, according to the PowerSwitch scenario, but they could reach 17 million tons in 2020 in the Business-as-usual scenario. If the carbon credits obtained with the PowerSwitch scenario at an international projected cost for 2020 of 32 Euros/ton of CO2, there would still be a R$ 5.6 billion credit in 2020 (or almost 2% of the total cost of the total PowerSwitch scenario). If the emissions accumulated during the 2004-2020 period are taken into consideration, the PowerSwitch scenario adds up to a total of 413 million avoided tons of CO2, surpassing the 403 million tons of CO2 that the Pro-álcool Program was able to avoid between 1975 and 2000. Such saving could mean an accumulated revenue of R$ 47.5 billion during that period.

To make the PowerSwitch scenario real, the government must approve and program a strategic plan for a more efficient and innovative electric sector, in such a way as to promote the effective implantation of the energy efficiency measures, as well as the greater utilization of renewable sources. Such a plan must include all nine of the following measures:

1 ***Energy efficiency auctions***

Energy efficiency auctions must be implemented, that is, a certain amount of energy to be conserved must be established (and/or the withdrawn power) as well as its respective trade, that may be made, for example, through an independent organ or government agency. That is an alternative way to make viable, by means of market agents, the realization of measures that save energy in the sectors of supply and final uses. As far as the final uses are concerned, it will permit the development of energy efficiency services companies; as for the supply sector, it will lever the recovery of older hydroelectric plants by means of repowering. (Brazil has a great potential for older plants. In other words, for the adequacy, modernization and correction of turbines and generators to improve capacity and efficiency. It is estimated that it is possible to obtain profits in installations that currently correspond to 32 installed GW (gigawatt), all of which have more than twenty years of use. Therefore, there is no need to build new plants.)

Those efficiency measures will have a potential of almost 290 TWh (terawatt-hour) in 2020 at a cost that is lower than that of the rate that would be exercised in that year. Besides, it must be considered that the auctions might attract market agents to make viable at least 15% of that potential.

2 ***Energy efficiency patterns***

The implementation of the Law of Energy Efficiency must become a priority through the accelerated approval of energetic performance patterns for equipment with more aggressive consumption reduction rates. As a complement to the performance patterns for the equipment, it is necessary to promote more efficient technologies and processes along the entire productive chain. Therefore, the government must approve energy efficiency levels to all productive sectors, giving priority to the energy-intensive ones, starting with the most inefficient segments and with those that present the greatest reduction potential. The implementation of the levels shall be made viable at first through incentives and later through fines or punishments if that level isn`t reached. Besides, obligatory technical patterns and the application of Research & Development resources (R&D) must be a part of policies directed towards the reduction of technical transmission and distribution losses.

3 ***Technological auction***

The public sector represents approximately 10% of the total consumption of electricity. Those agencies can specify performance patterns

that, in its turn, will stimulate producers to develop and to offer the product to meet that demand. That kind of initiative is particularly important when it is related to new technologies that have not been introduced in the market in a significant scale yet.

4 *Goals for investments in efficiency*

The obligatory investments to be made by the electricity companies in their energy efficiency and Research & Development (P&D) programs, besides the Energy Sectorial Fund (CTEnerg), estimated in almost R$ 400 million/year, must be better coordinated so as to guarantee the maximization of social benefits. Therefore, it is necessary to define goals for the results of investments in efficiency, to improve the capacity to monitor, verify and assess the results in terms of MWh (thousands of kilowatts-hour) conserved and MW avoided, that are obtained through the application of those resources.

5 *National Program for Distributed Generation (Progedis)*

The government must implement a National Program for Distributed Generation, in which incentives that are stable, transparent and that permit the use of the potential of these technologies are predicted. Considering the great co-generation potential from sugar cane, valuation criteria and methodologies, used within the scope of the new energy auctions, must be included in the previous public hearing processes.

6 *Program for the Incentive of Alternative Electricity Sources. Second Phase (Proinfa II)*

The announcement and the implementation of a second phase of Proinfa aim at ensuring 10% of the electricity production coming from renewable sources by 2010, and as much as 20% in 2020. The functioning of the program in a less bureaucratic, more transparent manner and adapted to the needs of the renewable energy sources producers would be a great profit for that second phase. It is crucial that economic incentives are ensured for that program, along with the National Program for Distributed Generation, to which part of the resources saved with the avoided electricity generated can be allocated, through the Energy Efficiency Programs, in such a way that the growing rates are not transferred to the consumers.

7 *National Program for Thermal Solar Energy (Prosolter)*

In order to use the great potential of thermal solar energy in Brazil in an effective manner, there must be a national program for that clean and cheap energy source. That program must include development goals, the offering of incentives for the funding to the final consumers and fiscal incentives, such as lower taxes. The poor populations can benefit the most from such measures. It is crucial to point out the need for installation obligations in new buildings. Almost 9% of the total energy savings of the PowerSwitch scenario come from

the implantation of a national program that is expected to reach almost one-third of all Brazilian households in 2020.

8 *Reduction of the subsidies to the conventional energy sources*

The subsidies to the fossil fuels favor electricity waste and hinder the insertion of renewable sources in the Brazilian energy matrix. There must be a reduction and an occasional elimination of these subsidies, such as the Fuels Consumption Account (CCC) that distort the market in favor of fossil fuels such as coal and diesel. However, there must be a distinct treatment between the use of the CCC resources for the interconnected system and for isolated systems. In 2006, more than R$ 4.5 billion will be spent with CCC, ten times more than the value of the compulsory investments by the electricity companies in energy efficiency programs.

9 Constant information dissemination

Although Brazil has developed information programs, through the National Program for the Conservation of Electricity (Procel), the National Program for the Rationalization of the Use of Petroleum By-products and of Natural Gas (Conpet) and the energy companies themselves, it is necessary to maintain a continuity and regularity in the dissemination of up-to-date information on energy technologies and in more efficient manners for its use. There still are significant barriers, particularly for the propagation of technologies concerning the thermal uses of solar energy, in the residential and industrial sectors as well as in buildings.

Notes

1 Summary elaborated by the *Estudos Avançados* editorship of the document by WWF-Brazil called "Business-as-usual Agenda for 2020", of September 2006. Available at: <http://www.wwf.org.br>.

2 Non-Governmental Organization, Brazilian section. The WWF acronym has two meanings. The distinction is simply a matter of styles. In the United States, World Wildlife Fund, and in Europe, World Wild Fund for Nature. In Brazil, until not long ago, the organization used the translation "Fundo Mundial para a Natureza". But recently it opted not to extend the acronym anymore – it is a symbol. When WWF was founded, during the 1960`s, it coincided with the entrance of panda specimens in the West, sent to the London zoo. That was a mark for the time, and the panda became the symbol-flag of the extinction of the species on the verge of extinction problem.

Abstract – This paper studies energy and climate security by means of establishing a more aggressive energy efficiency policy and implanting other renewable energy sources. It compares two different scenarios: the first one follows the current energetic trends and the second searches for sustainability. In 2020, the latter will present the following results: up to 40% reduction in electricity demands and an economy of thirty three million Reais in the national electric bill.

Keywords: Energy security, Sustainable development, Cost reduction, Kyoto protocol

– This text has been translated by Rodrigo Sardenberg. The original in Portuguese – "Cenários para um setor elétrico eficiente, seguro e competitivo" – is available at www.scielo.br/scielo.php?script=sci_issuetoc&pid=0103-401420070001&lng=pt&nrm=iso

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