

ARE THE ELECTRIC PLANS FOLLOWING THE BRAZILIAN ENERGY POLICY?

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ABSTRACT

The first article of Brazilian law 9.478, enacted in 1997, provides the main objectives for the country's energy policy. After this law came into force, all public and private investments bringing about increase in energy offers should comply with these objectives. The 1990's saw privatizations of major distribution companies as well as of some generation companies, stretching even into the 2000's. At the same time, the basic rules for the electric sector were also modified. The Government maintained its planning role in this sector. Law 10.847, enacted in 2004, sets forth the guidelines for the electric sector's activities. Since then, many rounds of bids have been conducted in order to meet increasing needs of generation and transmission. Now, almost ten years after the introduction of the new rules, some electric-generating plants and transmission lines have been built or are under construction. There is doubt whether these rounds will suffice in satisfying the original goals. Today, nuclear energy is produced exclusively by the State, and it seems that it will remain so for years to come. It is usual to hear that the nuclear energy does not participate in the natural competition existing in the planning stage, because this source is a State imposition. Nuclear plants are built in a pace that guarantees the maintenance of nuclear technology in the country. But nuclear energy has not been banned from electric planning. This planning must encompass all possible judgment criteria, so that the positive aspects of nuclear energy may also stand out. In this way, the objectives established by Law 9,478 may not comprise best judgment criteria. If the planning shows nuclear energy as an attractive alternative, it should not then be adopted as an obligation.

1. INTRODUCTION

An auction by the National Electric Energy Agency (ANEEL, the Portuguese acronym) to increase the Brazilian capacity of electric generation chose a company which will use imported mineral coal at a thermal power plant to satisfy this generation increase, based on a recommendation by the Energy Research Company (EPE). The impact of this decision on the employment generation for obtaining the energy source is null and the contribution to the country's energy self-sustainability is negative. In its recommendation, EPE did not recall the drama experienced by Brazil after the second oil shock in 1979. At that time, it was difficult to close the accounts of the Brazilian trade balance. With so many electric-generating sources in Brazil, importing mineral coal seems irrational.

Also incomprehensible was the discovery that the current Federal Government program "Luz para Todos" ("Light for All") does not find support in Law 9,478, which defines Brazil's energy objectives. Strangely, this law provides for the protection of consumers' interests and not the interests of citizens. The common citizen is unable to analyze the planning model used by EPE to determine energy sources and technologies to be used for meeting increased demand, due to its likely complexity and also because this information is not available to the general public. Because of sheer ignorance, the ordinary citizen may be falling into a trap, with the added burden of picking up the loss created by a preposterous model.

2. PROBLEM DESCRIPTION

Planning for the electric sector is different from any other energy planning by several issues. The electricity generated by different technological options, using some energy sources, is a common product. However, these sources and their technologies grant specific characteristics to the electric model. In this way, there are the concepts of firm energy and variable energy, sources that work at the base, seasonal and intermittent sources, which are dependent on climatic factors such as the intensity of the rainfall and the wind, or insolation. Also, these sources and technologies involve different social and environmental impacts, as well as a variety of subjective perceptions of security.

Understanding of the sector becomes even more difficult given the fact that Brazil's main generating source is hydraulic power, with its multiple uses. The water running through the rivers, in addition to feeding the hydraulic turbines, serves to supply cities and the rural properties, for irrigation and other uses. A dam built for electric generation can also regulate the flow of the river, and make it navigable upon the construction of locks. It may also create a fishing spot in the lake generated by the dam.

Superimposed to these differentiations, there is the institutional model of the sector, which has been modified more than once over the past two decades, with the main introduction being a mercantile vision. With this model, new classifications appeared, for instance, old and new energy, free consumers, independent generators, bilateral agreements and private contracts. To provide an idea of the confusion in today's existing system, generators are paid under existing contracts for the sale of energy, but energy is generated based on dispatch decision by the National System Operator (ONS) who, in turn, takes into consideration physical criteria, such as the level of the reservoirs.

A model that includes all these variables, concepts and interactions would be extremely complex and, thus impossible to be put to work. There are simplifying assumptions, which make modeling possible, although they cause lack of representativeness. All this creates an ideal scenario for those who want to make money out of corruption practices, going unnoticed. Few persons will know about the money transfers that occur and fewer still will oversee the system.

There is specific knowledge in government agencies, in private agents who invest in the sector, in the Academia and in professional associations, which allows them to understand what takes place within this sector. Very few people in the press can translate the technical lingo for the ordinary citizen, who will only be aware of elementary concepts. Few politicians are knowledgeable of this subject. In the above mentioned production-consumption structure, the institutional system and other conditions also mentioned, the only instances left to protect the people against decisions that will require more resources than necessary are the Academy, associations and, depending on the occasion, the State. As always, the citizen is the weakest link of any trading system.

3. EMPIRICAL SEARCH FOR A SOLUTION

With no intention of generating a parallel model to verify the adequacy of the planning model used by EPE and, therefore, without going into the details of an electric planning, premises

and objectives for an alternative planning are presented as an attempt to establish the basis of a better solution.

Starting exactly from the major goals of the energy policy, decided upon during the most liberal phase of our economy in the 1990's, allowed identifying gaps and deficiencies of this energy planning. Article 1 of Law 9,478 is quoted below.

"National policies for the rational use of energy sources will focus on the following objectives:

I – Preservation of the national interest;

II – Promotion of economic development, expansion of employment and enhancement of energy resources;

III – Protection of the consumers' interests with regard to price, quality and availability of products;

IV – Protection of the environment and promotion of energy conservation;

V - Ensuring the supply of petroleum products throughout the national territory, in accordance with the Constitution;

VI – Increase of the use of natural gas in economic bases;

VII – Identification of the most appropriate solutions for the supply of electricity in different regions of the country;

VIII - Use of alternative energy sources, through the economic use of inputs available and applicable technologies;

IX – Promotion of free competition;

X – Attraction of investments into energy production;

XI – Improvement in the country's competitiveness in the international market.”

After some improvement and reordering of these goals using logical reasoning, new objectives for the energy planning can be recommended, as listed in the next paragraph. The reason to show an alternative list of national energy goals is to highlight the irrationality of the current objectives. Some of the goals that should be considered are disregarded by the official plan. For example, there is a priority, understandable to some extent, for national renewable sources. However, if a non-renewable source is abundant in our territory and satisfies other evaluation criteria, then it should be used. This recommendation does not exist in the governmental list of goals.

I - Provide the necessary energy to the national market in the short, medium and long term, ensuring the development of the country.

II - Meet the needs of the entire society, regardless of social class, reaching the universalization of energy consumption.

III - Use the energy sector as an instrument for the implementation of public policies, including in this objective alternatives to contribute as much as possible with the generation of jobs and social inclusion.

IV - Generation, transmission, distribution and consumption of energy may cause damage to the environment which must be minimized.

V - Promote energy conservation, in order to mitigate increasing energy needs.

VI - Ensure energy supply throughout the country, even in furthestmost places, using regional energy solutions.

VII - Prioritize the use of renewable energy sources and, in case of a non-renewable energy source abundant in the national territory, also make use of it.

VIII - Use alternative energy sources, even though not economically attractive today, if they are likely to become competitive in the future upon gains of scale. In that way, they will contribute to the future national supply.

IX - Protect consumer interests with regard to price, quality and availability of products, through free competition.

X – Improve the country's competitiveness in the international market.

XI - Energy supply for the country should consider geopolitical aspects. As a consequence, energy can be used as a tool for regional integration.

Other examples of energy goals not welcomed by current planning as priorities are: (1) the use of decisions regarding the energy sector to meet public policy; (2) the use of today's more expensive sources with the prospect of decreasing future costs; and (3) the prioritization of geopolitical and strategic aspects. The following paragraph is an excerpt from the Press Release of the "10 year Energy Expansion Plan" (PDE 2021), which contains a fundamental error:

"The installed capacity in the National Interconnected System (SIN) will grow 56% over the 2012-2021 period, jumping from 116,500 MW to 182,400 MW. One of the highlights of the new planning cycle is the strong growth of the wind source, whose installed capacity will reach, according to projections, 16,000 MW at the end of the horizon – beyond the capacity of biomass generation, which will be 13,000 MW."

In this paragraph, there is a strange option, explained as a technical decision, whose existence can only be explained by strong political pressure. Although the details of this plan are not known, a "strong growth in wind generation" should not be advised. Also, "biomass generation" that, in this case, uses bagasse as input, should not be supported. These discordances are based in the following explanation.

Wind generation is intermittent, meaning that it varies with the intensity of the wind. In days when the wind is weak, generation is almost null. Therefore, with respect to this source, one can speak about the average electricity to be generated in a future period of time and never about the electricity that will be safely generated in this period. Thermoelectric generation using bagasse as source is seasonal, since the production of sugar cane, bagasse and alcohol are seasonal. Since the demand for electricity requires a guaranteed supply system, wind generation and thermoelectric using bagasse may not be used, unless there is an alternative thermoelectric source using natural gas or oil derivatives, for example, on stand-by to be used when necessary.

Thus, electricity generation costs from wind or bagasse, to be adopted for the decision-making process regarding the construction of new generating units must include the respective costs of the standby thermoelectric plant. However, the cost related to this standby plant to ensure those sources can generate a constant amount of electricity has not been included for the cited comparisons. This decision is explained in the following paragraphs.

When the dam of a hydraulic generation unit is built, it can be planned to have a multi-annual reservoir, which allows the transfer of water from a "wet year" (with good rainfall) to "dry years" ahead. At the beginning of the construction of dams for hydroelectric power plants in the country, the dams could accumulate water for more than one season. So, those plants could follow the daily and seasonal variations in demand. Finally, these plants can also be used to supply electricity when the wind is weak or when bagasse production is down. In this way, the hydroelectric power plant was used as stand-by for the wind power plant and the bagasse power plant, eliminating the need of thermals using natural gas or oil derivatives.

The cost of hydraulic generation is quite lower than the cost of thermal generation from natural gas or oil derivatives. Hence, in occasions when there is no wind or bagasse, if there is much water left in the reservoirs, the electric planning decides that the hydroelectric must generate additional electricity to substitute the lack of the other two sources. EPE decided also not to add the stand-by cost to the electricity obtained from wind or bagasse, what is incomprehensible. In countries where there are no multi-annual reservoirs, the cost of stand-by must be added to allow accurate comparisons. This is the reason why wind generation requires state subsidy in Germany, while it does not receive any support in Brazil.

Another fact makes the complementation of wind or bagasse with hydraulic even more attractive. In a year with little rain in regions nestling the major multi-annual reservoirs, the wind is strong and constant in the regions where wind power plants are located, and vice-versa. The same happens with bagasse. The production of bagasse is higher when the dams are not accumulating water, and vice-versa.

However, the large reservoirs usually flood marginal areas forming great lakes. The exception is when the river flows in a canyon and water levels rises when barred, with no flooding of adjacent areas. Flooding often requires the relocation of indigenous villages and towns and compensation to the owners for the loss of land. Despite all compensations provided by the Government, environmental entities supported by international organizations came out winning, and succeeded in barring the construction of new multi-annual reservoirs.

Since the 1990's there have been restrictions imposed on large reservoirs by State environmental agencies. As a consequence, generating plants are now planned to use basically the course of the river. This means that the new dams serve only to exploit the waterfall and not to store water from one year to the next. Belo Monte, Santo Antonio and Jirau are three hydroelectric plants under construction today whose lakes formed by the dams will be minimum. This ideological position against the multi-annual reservoirs will force the country to build more thermoelectric plants using natural gas or oil derivatives, increasing the emission of greenhouse gases into the atmosphere, while also making the generation of electricity from wind or bagasse much more expensive.

Without discussing whether the fear of nuclear energy is justifiable - or not -, electricity generated by nuclear plants comes at a cost not exceeding the costs obtained with wind or bagasse, after adding the stand-by cost of a thermal using natural gas or oil derivate, which is the proper way to make the comparison. Nuclear power plants generate only firm energy and have the highest capacity factor among all generating sources, a figure over 80%. The fear of nuclear energy is probably instigated by economic interest groups who will lose profits if the nuclear option is adopted. This issue can only be solved by means of honest and democratic debate. However, it is clear that nuclear energy is not an intermittent or seasonal energy and, therefore, does not need any stand-by facilities.

Many technological developments must occur before alternative sources for electricity generation can compete in terms of cost with traditional sources, namely: hydraulic, fossil fuels (natural gas, oil and coal), bagasse, charcoal, nuclear and the group's newcomer, wind. This source earned its current status thanks to successful technological improvements that made its generation cheaper. Solar energy for electric generation, a proposal that is so mentioned, still needs further technological development before it becomes competitive.

As a note, environmentalists have to decide what is important for them. They stand against large reservoirs and nuclear power plants and, simultaneously, advocate wind and solar

generation, implying they are choosing to install more wind power plants and more thermal generation units using natural gas or oil derivatives. Today, solar power generation is still a dream. In other words, they opt for more greenhouse gas emissions in exchange of less flooding of marginal areas and less perception of nuclear fear. The recommendation of the same environmentalists towards building a society that is less electric-intensive is a good idea, but the consequent reduction in electricity demands, besides requiring great efforts of persuasion, will eventually hit a cap impossible to overcome, just because there are physical limits for this conservation. In other words, the rationalization of the use of electrical energy is not an energy source.

It should be kept in mind that Brazil needs an average addition of 3,000 Mw every year to support the growth of its economy, the increase of its population and the process of social inclusion seen in recent years.

If the Brazilian Government continues to build hydroelectric plants without multi-annual reservoirs, which seems to be the most likely to happen, the electricity from hydraulic source will start to suffer from strong seasonal influence. Therefore, it will be impossible for this source to compensate wind intermittence and the seasonal features of bagasse, at least in the "dry years". If these alternatives are chosen, it will be necessary to add thermoelectric stand-by plants running on natural gas or oil derivate. However, in this case both wind and bagasse will lose competitiveness in terms of cost.

4. RECOMMENDATION AND CONCLUSION

EPE and other agencies of the electric sector should, in addition to showing transparency in their planning, no longer assess electricity generation from wind and thermoelectric generation using bagasse for competition without considering the need for stand-by units. For the sake of comparison, the cost of the stand-by energy should be added to the present cost of these energies. Finally, the electric sector model should be adapted to this new reality.

The following conclusion is an excerpt from the paper "Decision Process Regarding Nuclear Generation: The Brazilian Case" presented at INAC 2009, which analyzes Brazil's electricity planning, and it still remains accurate.

“Therefore, the complex technical, economic, environmental and social settings of electricity expansion alternatives, which must be judged under relevant criteria, many of which may not be quantified, added to lobbyists' activities, to the lack of constructive, democratic mass communications, and to the governmental decision-making process inaccessible to the ordinary citizen, result in a situation where a rather small number of decision-makers, under strong influence by groups of interest, define the future of the Brazilian energy sector, and consequently, the country's nuclear sector as well.”

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