

ORGANIZATIONAL MODEL OF THE NUCLEAR SECTOR

Paulo Metri

Comissão Nacional de Energia Nuclear – CNEN
Coordenação Geral de Planejamento e Avaliação
Rua General Severiano, 90, sala 227
22.294-900 Rio de Janeiro, RJ
pmetri@cnen.gov.br

ABSTRACT

The Brazilian Constitution prohibits private investment in many activities of the Nuclear Industry. Right now, it is in progress a constitutional amendment that allows private companies to build and operate nuclear power plants of its own. This work rescues the historical reasons that led the Congress of 1988 to choose the State owned model for this sector. In addition, the arguments that are used to propose the present changes are repeated here. As indicated in INAC 2015 website, "sustainable development is supported by three pillars: social, economic and environmental." Thus, the organizational model to be adopted for the Nuclear Sector must meet these requirements. The official objectives of the energy sector, as set out in the law 9,478, are remembered. New objectives, better established, and also adapted to the electrical subsector, are shown. Besides the use of these objectives to choose the sources and related technologies for the electric generation, they also can be used as evaluation criteria to help in the decision process of the organizational model for the Nuclear Sector. Acting in this way, it is ensured that social, economic and environmental requirements are being attended. Finally, if the developed evaluation criteria are applied, the impacts of each organizational model can be analyzed and preliminary conclusion and recommendation can be made.

1. BRIEF HISTORICAL REVIEW

The Brazilian Constitution was approved on 1988. Some years before, the principles of economic liberalism started to be reintroduced in world economies, being Thatcher and Reagan two of the first leaders to apply them in the economies of their countries. The objectives of economic liberalism, as well as its criticisms, are well disseminated and will not be repeated here.

Deliberately, it is avoided the discussion on the attractiveness of growth models of countries, because this is not the main issue of this paper. However, few characteristics about these models need to be stated. When an underdeveloped country adopts the liberalism principles, its level of sovereignty diminishes and its dependence to foreign countries increases.

Thus, an underdeveloped country cannot apply principles of economic liberalism and, at same time, have a high degree of sovereignty. The periods of more sovereignty and the ones of more actions of subordination are frequently changing. They are related to the internal political moment and the international political conditions.

In a quick view, in the great period that Vargas stayed in power, in the short period of Goulart, as well as in almost all military periods (the exception is the period of Castelo Branco), in the Sarney period and during the short time that Itamar was president, there were

clear gains of sovereignty. In the Kubitschek period, in the short time of Collor de Mello and in the period of Cardoso, the level of dependence was increased.

The first liberal wave of the 20th Century happened in the years 1920 and led to the world depression of 1929. The period, when there were two nations disputing the hegemony in the world, occurred basically from 1945 to 1991. In this period, the underdeveloped countries found better conditions to develop their economies. After the debacle of the Soviet Union and the consequent conquest of the world hegemony by United States of America (USA), the capital, great allied of this hegemon, started to introduce, for the second time in the 20th Century, the liberal principles in almost all economies of the world.

In periods of sovereignty, the national State tends to protect its people of the harassment of the capital. The number of State owned firms tends to increase, during sovereignty periods, and privatizations occur more in periods of dependence. To achieve a high level of social welfare for its people, a nation must be sovereign, what means that its population must understand and participate of all important decision of the country. This requires that the population should be politically conscious.

If a country is not sovereign, it is impossible to have a high level of development. The USA are the best example of a country that is always chasing a high level of sovereignty. The lack of sovereignty is the beginning of a poverty process. Nowadays, the domination of the forces of a country is a very sophisticated action. It uses Machiavellian procedures, like media control, pressure of international agencies, the spying of intelligence agencies and capture of leaderships of the dominated country.

2. THE SPECIFICITY OF THE NUCLEAR SECTOR

This second liberal wave arrived in Brazil with some delay, once the Brazilian Constitution, completed on 1988, during the Sarney government, still was written with many principles of sovereignty. This Constitution organizes all the activities of the oil and natural gas sector and the nuclear sector, in its Article 177. Regarding to the nuclear sector, it is established the following:

"Article 177 – Are the monopoly of the Union:

(...)

IV. the prospecting, mining, enrichment, reprocessing, industrialization and trade of nuclear ores and minerals and their derivatives, with the exception of radioisotopes whose production, marketing and use may be authorized under a permission, pursuant to subparagraphs b and c of section XXIII of the caput of Article 21 of this Federal Constitution.

(...)

§ 3. The law shall provide for the transport and use of radioactive materials in the country."

The decision process to end an established monopoly or the decision process to privatize an existing state firm uses the same reasoning to have them solved. *"Is it better for the society to have this sector with great participation of the State or is better to have it well privatized?"* These decisions open or close the sector for private firms.

The liberal arguments are the same for the nuclear sector and all other sectors of economy. The more important one is that Brazil does not have financial resources to invest in the necessary infrastructure, if it is supposed to grow at least at 3% per year. Also the Brazilian government must stay in the planning and regulatory activities, and should never invest directly to obtain electricity. Continuing, the electric energy produced by the State is certainly more expensive. And, in some cases, the technology used by the private firms is more reliable.

It is correct that the State must plan and regulate all sectors of the economy, including the nuclear. But, in special cases, the State can also invest directly in the production of energy. For example, in France, a State owned firm, called EDF, produces about 80% of the electricity consumed in this country. Other example, in the USA, country that was one of the pioneers in the application of the liberal principles, the Tennessee Valley Administration, a State corporation, even today, has hydroelectric generating plants.

The argument that Brazil does not have money to invest in infrastructure was used exhaustively in the years 1990, in order to Cardoso obtain the authorization for the privatization program. Later on, Brazil financed the acquisition of all privatized firm.

This concept that private firms are more efficient than the State owned firms was repeated to exhaustion by liberals in order to be recorded as a truth. The great example of State owned firm, that is extremely productive, is Petrobrás. It is one of the greatest oil firms of the world. It developed many of the technologies that permitted to increase its reserves and the production of oil, achieving recognition among its competitors. So, the concept created by liberals that private firms work better than the State owned firms is not true.

Nevertheless, the decision to privatize some State firms in the nineties was correct. Also, the privatizations of other State firms were questionable, like the privatization of Vale do Rio Doce. The complete guidelines that define what should belong to the State and, as a consequence, what must be private, were never given to Brazilian people. What was given to Brazilians was merely propaganda of one side and a republican discussion never happened.

Right now, a constitutional amendment that allows private companies to own nuclear generating plants is being discussed in Congress. This amendment does not include the processes and the plants of the fuel cycle. Today, there is other amendment in the Congress, related to the fuel cycle, but the present work does not include the analysis of the fuel cycle case. Nowadays, we can read in newspapers and we can listen in seminars that private nuclear plants will help Brazil to avoid the shortage of electrical energy.

3. HOW TO EVALUATE THE ORGANIZATIONAL MODEL ALTERNATIVES FOR THE NUCLEAR SECTOR?

The sustainable development is exactly the way to preserve humanity with the human beings and it must attend to the social, economic and environmental requirements. Thus, the organizational model for the Nuclear Sector to be adopted must meet these three requirements.

The Brazilian energy policy is established in the first article of the law n. 9.478, where the official objectives for the energy sector are communicated. Unfortunately, these objectives

need to be reformulated, once they do not satisfy some of the mentioned social, economic and environmental requirements. Their contradictions and lacks were already exhaustively analyzed in the paper presented to INAC 2013 [6].

After some reasoning, it was possible to improve energy objectives and, simultaneously, adapt them for the electric energy sector. It was not found, in the Brazilian government administration, a list of the objectives for the electrical sector. The deduced objectives are:

1. Minimize the average cost of electricity generated.
2. Maximize local purchases of goods and services during construction.
3. Minimize the purchase of fuel from abroad during operation.
4. Maximize the use of renewable resources or even non-renewable, if it is abundant in the country.
5. Satisfy the demand of firm energy.
6. Allow the adaptation to the demand of the daily load curve.
7. Maximize the job generation.
8. Minimize the environmental impact.
9. Ensure safety on the operation of electric plants.
10. Maximize the use of technology dominated by the country.
11. Contribute to the stability of the electrical system.
12. Satisfy the need of geopolitical and strategic attraction of other countries.

With these specific objectives, a mix of electric energy sources, that satisfy the demand, will be chosen and a sustainable solution will be achieved. Usually, the objectives of the electrical sector are used for deciding the sources and related technologies that must be chosen to satisfy the increase of electric demand. However, since these objectives represent the policy of the sector, all decisions of this sector must satisfy them.

With this understanding, the evaluation of the two alternatives of organizational model of the nuclear sector can be done by observing which alternative better satisfy the quoted objectives. In other words, the objectives of the electrical sector can be used as criteria for evaluation of the organizational model alternatives.

So, the change of the organizational model, from one with a State owned firm to other with the participation of private firms, will result in different impacts in the objectives of the sector. Observe that there is no Brazilian private firm with capacity to build and operate nuclear plants. Brazilian private firms can participate of consortiums with foreign firms that have this capacity. In these cases, the foreign firms will always be the leaders of the consortiums. So, in this text, “private firm” represents, mainly, the “foreign firm”.

It is common to hear that the source chosen to increase the electrical capacity must be competitive or, in other words, its generation cost must be cheaper than the costs of the other sources. This procedure represents a great simplification of a huge problem. Each economy sector has interference in a great number of other sectors. The electrical sector has interference, for example, in environment issues, payments balance and job generation. Besides this, each source and its related technology have technical characteristics that make different economic, social and environmental impacts.

4. APPLICATION OF THE EVALUATION CRITERIA TO THE ALTERNATIVES OF ORGANIZATIONAL MODEL

The organizational model, where only State owned firms are allowed to operate, will be called “State owned model”. The other model, where the firm that belongs to the State (Eletronuclear) and private firms can operate, will be called “mixed model”. There is not a “private model” because, as far as the newspapers say, Angra I, Angra II and Angra III will not be privatized.

From this point, each one of the described evaluation criteria will be applied to the two organizational models in order to verify if there are significant differences between them. For instance, which of the two models better satisfies the first objective: “minimize the average cost of electricity generated”? The answer is that, with the present informations, it is impossible to ensure that one organizational model is better than the other. This evaluation criterion must be analyzed very carefully, because there are different values of cost related to different levels of safety of the nuclear plant. Thus, it is necessary to define a desired level of safety and, for this level, the costs using different organizational models must be compared.

For the second objective: “maximize local purchases of goods and services during construction”, the “State owned model” will satisfy it better, because Eletronuclear certainly will buy more in Brazil than any foreign firm. Again, for the third objective: “minimize the purchase of fuel from abroad during operation”, the “State owned model” will satisfy it better, because Eletronuclear buys the fuel elements in Brazil, while the foreign firms will buy them with their matrix.

Which model better satisfies the fourth objective: “maximize the use of renewable resources or even non-renewable, if it is abundant in the country”? Both models are related to a “resource non-renewable abundant in the country”. However, the “State owned model” will use uranium produced in Brazil, while the “mixed model” will not use the Brazilian uranium.

For the fifth objective: “satisfy the demand of firm energy”, the options of organizational model equally satisfy the demand of firm energy. There is no difference between the two models for this evaluation criterion. In the same way, for the sixth objective: “allow the adaptation to the demand of the daily load curve”, both options of organizational model give the same result, because the nuclear technology was not designed to follow the daily load curve.

With respect to the seventh objective: “maximize the job generation”, the “State owned model” will do it better, because Eletronuclear will buy more engineering, construction, equipments, industrial assembly and fuel elements in Brazil, than any foreign firm. These local acquisitions represent more jobs that are being generated in the country.

About the eighth objective: “minimize the environmental impact”, it can be said that the nuclear source for electricity generation is one of the sources that causes less environment impact and both organizational models do not interfere in this result. In relation to the ninth objective: “ensure safety on the operation of electric plants”, again both models will equally satisfy this objective. But, one of the main reasons is because the firms will be inspected by the Comissão Nacional de Energia Nuclear, which applies the same requirements to ensure the safety, no matter what organizational model is being used.

The “State owned model” is the only one that satisfies the tenth objective: “maximize the use of technology dominated by the country”. For example, the Brazilian technology of uranium

enrichment will only be used if this model is adopted. Eletronuclear buys its fuel element demand with INB. Which model better satisfies the eleventh objective: “contribute to the stability of the electrical system”? Once again, both organizational models contribute equally for the stability of the electrical system.

For the twelfth objective: “satisfy the need of geopolitical and strategic attraction of other countries”, the “State owned model” is the unique solution, because it is impossible for the government to have control on foreign firms. For example, if a country wants to sign a cooperation agreement in the nuclear field with other country, with the approval of IAEA, it will be impossible if there are only foreign firms in the country.

5. CONCLUSION AND RECOMMENDATION

For the first evaluation criterion, an answer was not obtained, because there was little information. But, this was an exception. For all other eleven criteria, answers were obtained. The “mixed model” was not recommended in any of these eleven criteria. The “State owned model” was recommended in six of them. And in five criteria, the organizational model does not make difference. Based on these data, the conclusion is that the organizational model, where State owned firms are the only ones authorized to construct and operate nuclear plants, is recommended. The table shown below summarizes the conclusions.

Situation *	Criterion											
	1	2	3	4	5	6	7	8	9	10	11	12
1	X											
2					X	X		X	X		X	
3		X	X	X			X			X		X
4												

* Situation 1 – The insufficiency of data does not permit a conclusion.

Situation 2 – Both “Stated owned model” and “mixed model” satisfy the criterion.

Situation 3 – The “Stated owned model” satisfies better the criterion.

Situation 4 – The “mixed model” satisfies better the criterion

The next step is that this study needs to be more detailed and confirmed. However, it is already possible to say that the simple affirmation that Brazil needs foreign firms to “help” its efforts on satisfying the electrical demand is not sufficient to adopt this option.

REFERENCES

1. “Posição da Academia Nacional de Engenharia Sobre a Situação do Setor Elétrico Brasileiro”, http://www.anebrasil.org.br/ane2014/images/pdf/opinioes/Setor_eletrico.pdf (2015).
2. Muller, A., “Nuclear, já!”, *Jornal O Globo*, <http://oglobo.globo.com/opiniao/nuclear-ja-15338417> (2015).
3. Alquéres, J. L., “É hora do nuclear ser considerado sem preconceitos”, *Revista Brasil Nuclear*, <http://ilumina.org.br/entrevista-jose-luiz-alqueres-revista-brasil-nuclear/> (2015).
4. Metri, P., “A energia nuclear”, http://www.correiodadania.com.br/index.php?option=com_content&view=article&id=10853:submanchete120615&catid=82:paulo-metri&Itemid=206 (2015).

5. “Empresários propõem a presidencialíaveis fim do monopólio nuclear no país”, *Jornal O Globo*, <http://oglobo.globo.com/economia/petroleo-e-energia/empresarios-propoem-presidenciaveis-fim-do-monopolio-nuclear-no-pais-14057273#ixzz3efd3HKFB> (2014).
6. Metri, P., “Are the Electric Plans following the Brazilian Energy Policy?”, *Proceedings of 2013 International Nuclear Atlantic Conference - INAC 2013*.