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ENERGY SUPPLY AND DEMAND IN AMAPÁ: STRANGULATION AND RESTRICTION TO THE LOCAL MARKET

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SUMMARY

The studies on electricity consumption in Amapá aim to present a historical approach aimed at understanding the factors that demanded its increase. In view of this context of evolution of electric energy, the following question arose: what are the difficulties and transformations the energy sector suffered in the state of Amapá from 1990 to 2010. As a methodology, a bibliographic survey was carried out on articles, dissertations, books and websites . The results show that the state had a population growth in the period investigated, which influenced the increase in energy consumption. Since the discussions here in this work have turned the low demand for energy in relation to the other states, it can be seen that the evolution of this sector, occurred not only in the growing local consumption in recent years, but also,

Keywords: Energy Sector. Demand. Consumption. Amapá.

1. INTRODUCTION

Energy in the state of Amapá has its peculiarities aimed at consumption, potential, location and investment, since all these indicators do not go together and, in order to understand the process of energy growth in Amapá, it was necessary to conduct an investigation on what implied the growth in energy consumption, and how this demand came about due to demand. Starting from this point of view, a problem was identified here, with regard to the strangulation of electricity, forced by local demand.

In order to have a better understanding of the location, this introduction presents the specifications of Amapá, which is located in the extreme north of Brazil, with territorial limitations of 142,828,521 km², bordering French Guiana, with the State of Pará, Atlantic Ocean and Suriname.

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This work is salutary to the local economy, as a discussion on investments in the sector, from the supply of energy offered in the period from 1991 to 2010. According to the history shown in the specific literature, the energetic force in the state was given to supply the great However, no more in-depth studies, both environmental and economic, were carried out for the future projection of demand for this offer on a large scale and in the long term.

Based on research, a hypothesis was chosen, which beckoned population growth over the years, however, the state did not foresee targets to supply this demand, even though it has information that shows that Amapá has great natural potential. for the constriction of hydroelectric plants. After this period, the insertion of Amapá into the new model of the energy sector began, and this became part of the National Interconnected System - SIN, a process that opened the opportunity for the installation of new hydroelectric plants in the State.

The methodology used to carry out this work was exclusively bibliographic, through theses, dissertations, articles and websites. After data analysis, the items that covered the work and making a connection between them were interpreted. This article is composed of the following parts: Historical approach to energy in the State of Amapá, Energy growth in the State of Amapá, the process of interconnection to the SIN and discussions and results and considerations.

2 THEORETICAL REFERENCE

2.1 HISTORICAL APPROACH TO ENERGY IN THE STATE OF AMAPÁ

The evolution of energy in Amapá converges with the arrival of large industrial projects, triggered by the companies ICOMI and CAEMI, in the 1970s, and also by the demand in the Municipalities of Macapá and Santana, where the large population masses were concentrated (PORTO , 2002). Prior to the operation of the Coaracy Nunes Hydroelectric Plant (UHCN), the consumption of electricity was due to the use of diesel-powered thermoelectric plants, both in the capital and in small towns. According to Drummond and Pereira (2007), in the years 1980 to 1982, fuel was responsible for 70.24%, 60.64% and 61.35% of the energy consumed in the state, respectively.

> These figures were recorded when the Coaracy Nunes hydroelectric plant (UHCN, popularly known as Paredão) started to operate, still on a partial scale, and give an

> idea of Amapá's energy dependence on imported oil. (DRUMMONDand PEREIRA, 2007, P. 90)

According to Drummond and Pereira (2007), under the responsibility of the Companhia de Eletricidade do Amapá (CEA), the Coaracy Nunes Hydroelectric Plant (UHCN) started to be built in the 1960s and was created by the government of the then Federal Territory. The amount earmarked for its construction came from royalties paid by ICOMI, under the sale of manganese, extracted from the state. In 1974, after years of delay in the plant's work, Eletronorte took over the Project, injecting funds for its completion in 1978, through Presidential Decree No. 74,303 of July 19 of the same year (Ferreira, 2012).

UHNC supplied power in the following years to the city of Macapá and Santana, and later expanded to an additional 26 locations. Another interesting factor to be highlighted is the supply of energy to the working village and the mining operations of Serra do Navio, since 1982, which at that time was in the municipality of Macapá. According to Drummond and Pereira (2007, p. 90):

> The transmission line between UHCN and Serra do Navio was built by ICOMI itself. Two new thermoelectric plants were installed on the Macapá-Santana axis. In the 1980s, to reinforce the supply given to most of the population of the state residing there.

The UHNC is located in the municipality of Ferreira Gomes and is fed by the waters of the Araguari River, which originated a lake, formed by the 24.9 km² dam, which used to hold 40 MW at the time. In the months of September and December, it reaches its lowest level, however, its peak occurs in the month of May. In this context, it should be noted that the Coaracy Nunes Hydroelectric Power Plant can be considered as one of the main consequences of the mining operation Serra do Navio (DRUMMOND and PEREIRA, 2007), since part of the resources used for its construction comes from royalties paid by it and other sectors. “[...] the resources for the construction of this HPP were (SUDAM, 1967, p. 223): SUDAM (20%); Ministry of Mines and Energy (25%); ELETROBRAS (25%); royalties from manganese exports, established by the contract (20%);

Porto (2002) presents the energy sector developed in two distinct phases, the first with the presence of only CEA and the second, of CEA with ELOTRNORTE. The first occurred with the constitution of a mixed economy company that managed the energy sector in Amapá, as well as the management of thermoelectric plants and later the construction of the Paredão

Energy Supply and Demand in Amapá: Strangulation and Restriction to the Local Market. Hydroelectric Plant. The second phase was developed with the energy production of[4]UHE do Paredão, which increased the demand and distribution of electricity, as well as the installation of new thermal plants in the region. It is pertinent to highlight that this hydroelectric was the first in the legal Amazon, and also built with federal funds. However, even in the 1990s, there were 13 communities in the state of Amapá that depended on diesel-powered generators.

The construction of this hydroelectric plant was configured in several problematic ways, arising from "complaints of embezzlement of resources destined to it; constant change of managers of the Territory and of the concessionaire (CEA); and lack of financial resources for this sector in the regional context "(PORTO, 2002, p.137). This fact delayed the work by almost 20 years and, until 2002, UHCN, supplied hydraulic power to the "Municipalities of Macapá, Ferreira Gomes, Cutias, Serra do Navio, Santana, Mazagão, Itaubal and Pedra Branca do Amapari (with expansion forecast for Calçoene and Pracuúba) "(PORTO, 2002, p.137).

> Amapá's productive diversification had a strong impetus with the increase in energy supply by UHCN, in 1976, starting the "CEA / ELETRONORTE Phase" in Amapá's energy sector. With this HPP in operation, the capacity for electric power generation increased by 471.4% in relation to the existing thermoelectric plant, intended mainly for the industrial category (61.2%) (Table 14), notably for ICOMI and BRUMAS THE.

At that moment, an increase in the production of local electric energy is visible, to the detriment of the thermal plants previously installed, and with that, once again, we see the incentive of energy production in Amapá through the installation of industrial projects. To have a broader view of consumption in a time scale between 1976 and 1985 (9 years), a table of electricity consumption distinguished by the categories: residential, industrial, commercial and others is presented below.

Table 1 - Electricity consumption in Amapá by category (mvh)

Category	**1985 ***	**(%)**	1989	(%)	**2000**	**(%)**	**2010**	**(%)**	2015	(%)
Total	**100,798**	**100%**	127,013	100%	**430,844**	**100%**	787,460	100%	1,088,587	100
Residential	**44,603**	**44%**	58,657	46%	**220,343**	**51%**	407,810	52%	592,933	54
Industrial	**18,068**	**18%**	19,657	15%	**18,306**	**4%**	48,121	6%	38,623	4
Commercial	**15,400**	**15%**	21,683	17%	**78,833**	**18%**	181,324	23%	283,254	26
Others*	***22,727***	***23%***	***27016***	***21%***	***113,363***	***26%***	150,206	19%	***173,778***	***16***

Source: Elaborated by authors based on data available in SEPLAN Apud CEA (Statistical yearbooks 1989 to 2010); In the "others" category, government and rural energy consumption are included.

[4]Paredão Hydroelectric Power Plant. It was later renamed, becoming the Coaracy Nunes Hydroelectric Plant, in honor of the local parliamentarian, death in an air accident.

Table 1 presents data on the evolution of energy consumption in the State of Amapá between 1985 and 2010, showing the composition of energy demand in Amapá according to the economic categories of the market. It is noteworthy that until 1989 the Industry had a 15% participation, with a decrease in relation to 1985, that is, until the 90's this category had some relevance, however, from the 90's it fell significantly up to 4% .

Two factors must be considered in this behavior, first the demographic explosion and the urbanization of the city of Macapá intensified by the implementation of the Free and Trade Area of Macapá and Santana, and second, the depletion of mineral projects, in particular ICOMI. According to Porto 2002 "Industrial sector in the period from 1976 to 1985 registered a sharp decline (from 61.2%, to 16.8%), [...] due to the non-expansion of the industrial park in Amapá" (PORTO, 2002, p .141), this process was accentuated from the institution of the State of Amapá, so that Industrial consumption in relative terms was only 4% in 2015.

At the same time, Amapá becomes more dependent on the production of thermal energy, which increasingly restricts the process of industrial expansion, given that the state had no prospects at the time of implementing new hydroelectric projects.

Making an analogy between energy demand and consumption, Drummond and Pereira (2007, p. 91) make a prediction that “communities connected to the state distribution network and isolated ones will tend to continue in a situation of pre-scarcity”. In other words, investments and sectors that require steady energy are held hostage by restricted production. “New productive investments in the state that depend heavily on energy are, therefore, difficult or unviable” (DRUMMOND and PEREIRA, 2007, p, 91). As an example of this, until 1994, energy production was 91 MW, of which 44% came from UHCN.

According to Chagas (2010) the government of Amapá in partnership with Eletronorte hired a company to carry out a study on the energy potential in the state, in which 6 (six) hydroelectric potentials were identified. This shows the capacity to support large investments in the energy sector, since the country itself has this potential. According to Talmasquin (2012, p. 249)

> The identification of Brazil as a global energy and environmental power today is not an exaggeration. The country, in fact, is rich in production alternatives from the most varied sources. The supply of raw materials and large-scale production capacity are examples for several countries.

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These surveys pointed to a promising Amapá in electric energy production, since, according to this commissioned survey, generation would reach 602 MW. However, Drummond and Pereira (2007, p. 92), states that, “the hydroelectric potentials available in Amapá, mainly in the Jari and Amapari rivers, inventoried by ELETRONORTE are very high in relation to the modest production figures and the state's consumption [...] 2,429 MW, estimated. ”. Because these are very distant places, the costs would rise, and these works could be unfeasible.

Hydroelectric plants, mainly, were the works that suffered the most resistance, as they are grand and expensive. These ended up suffering the greatest impacts in terms of their construction and transmission. According to the survey of hydroelectric potentials identified by ELETRONORTE, the production capacity is much greater than the consumption of local energy, therefore, this factor restricts the interest in investments in this sector. Another aspect to be highlighted was the observation made about the locations where the waterfalls, which generate energy, were found, which in total, were found 16 (sixteen). However, its location is distant and this would compromise the construction of hydroelectric plants because of the high costs (DRUMMOND and PEREIRA, 2007).

In part, even considering the high population growth in the 90s, there was no demand capable of making hydroelectric production projects economically viable. The post-1990 scenario was one of a state dependent on government relations whose mineral sector was stagnant and with an important energy bottleneck, as production growth was conditioned to the production of thermoelectric plants, in the long run, this model would have important implications for the expansion of industry in the state.

2.1.1 The Amapá energy sector since the 1990s.

As mentioned above, the restriction imposed on energy supply was important to configure the economic scenario in Amapá until 2010, mainly because it does not allow the implementation of industrial projects. Thus, the configuration of energy demand was concentrated in the categories, Residential and Commerce, in 1989 these represented 44% and 15% of local consumption, in 2010, it was 58% and 23% corresponding to 81% of consumption.

In Porto (2002) there was already evidence of the expansion of electricity consumption in the "residential" category. This situation came from the demographic increase in Amapá, which registered a rate of 4.4%, in the period from 1970 to 1980, and 4.7%, between 1980

and 1990. In a ten-year period, the participation of households doubled, from 18.2% to 36.0%, and in the five-year interstice (1980 to 1985) there was a greater expansion. And the category that stood out the most, was "others" (corresponds mainly to the public sector), going from 12.1% to 32.9% of the total, with the biggest expansion, also, between 1980 to 1985.

It is then appropriate to correlate, the population growth indices in comparison to energy consumption, as shown in Table 2, it is highlighted that the population data available do not cover the years 1985 and 1989, as the Demographic Census would only be carried out in 1991. The idea in this case and evaluate the population variation in 10 years and compare it with the increase in energy consumption by Mvh in Amapá.

Table 2 - Analysis of energy demand compared to population growth in the period.
1990 - 2015 period

	1991	**2000**	**2010**	**2015**
Population (thousand)	288,690	477,032	669,526	766,679
Variation in the Period (units)	-	65%	40%	15%
Energy Consumption (Mvh)	127,013	430,844	787,460	1,088,587
Variation (Mvh)	-	239%	83%	38%
Combined variation	-	3,667%	2.05%	2.635%

Consumption grew at rates higher than the population between the years analyzed, in the decade between the years 2000 and 1991, for every 1% of population growth there was a growth of 3,667% in energy consumption. This indicator was 2.05 in the following ten-year period, this indicator dropped to 2.05% and until 2015 it remained at 2.63%, it can be concluded that energy consumption grows at rates above the population variation and that even with the reduction in the growth of population rates, this relationship has a tendency for growth as of 2010.

In the Amazon, in the 1990s, investments in the energy sector were scarce and this situation has not changed much over time. For Drummond and Pereira, (2007, p. 92) "(...) the construction of new large hydroelectric plants has been practically paralyzed for more than 10 years across the country, after the completion of the Xingó plant (located on the river São Francisco, between Alagoas and Sergipe) ". Specifically in Amapá, there was a[5]strangulation in the distribution of energy in the 1990s, a fact that led ELETRONORTE and local authorities to discuss these issues, however, the options raised presented problems, as pointed out by Drummond and Pereira (2007, p. 92)

[5]Until July 1997, the energy supply to Macapá and Santana was around 80 MW and consumption was registered by CEA at 78 MW. This means that if there was a decrease in rainfall in the headwaters of the Araguari basin or trimmed from a generating machine, whether for maintenance or repair, there would be energy rationing for these cities (PORTO, 2002, p.163).

> There are at least six alternatives that we will call and local. The first two are the expansion of the Santana thermoelectric plant (an additional 20 MW) and a new turbine for UHCN (an additional 27 MW). One or another expansion would place the supply slightly above the expected demand, but only the two together would offer an acceptable energy reserve for some time for peak demand times. However, after the necessary resources were guaranteed and allocated, there would still be a construction period of at least a year and a half for either option.

Concomitantly with the alternatives presented above, there was a third, which agrees with the second, that is, "the addition of about two meters in height to the UHCN dam, which would increase the generation capacity." Drummond and Pereira (2007, p. 92). However, there would be other problems, which would hinder its good performance, such as civil works around the dam, which would require time and would be very complex.

In the perspective of finding plausible solutions that would solve the strangulation issues, a fourth possible solution emerged, "the construction of one or more dams upstream. In these, there would be an accumulation of excess water that could be used in the drier season to avoid excessive generation of energy. " (DRUMMOND and PEREIRA, 2007. p. 93). The other alternatives were developed by the government of João Alberto Capiberibe, who sought resources abroad for the implementation of mini plants in distant locations, with the aim of expanding the generation of energy in the state.

The strangulation dynamics implied an important change in the 1990s in the productive structure of the energy sector in Amapá, as it moved from a hydraulic to a thermoelectric energy matrix, which in turn implied low quality of the energy supply and insufficiency to meet expansion of the economy, in particular, of the energy-intensive economic sectors, such as the beneficiation industry, for example. Only in 2015 this4 bottleneck was overcome, due to the interconnection to the SIN.

All of these alternatives point to a discourse that can be seen in the speech of Becker (2012.p. 3) where he says that the "Intense global controversy about the region's destiny imposes on Brazil the responsibility of dealing with this natural heritage as a regional issue. , national and global. " In other words, the Amazon has a wide natural potential to be explored, but the way this happens, implies great obstacles, since it can impact nature in an aggressive and degrading way.

In the 90s, with the thought of resolving the issue of energy strangulation in Amapá, ELETRONORTE made suggestions of great complexity and high investments, such as the transfer of excess electricity generated by the Tucuruí plant to the left banks of the river Amazonas, which would include the state of Amapá. However, all this effort, in addition to

being costly, would have energy for limited consumption (DRUMOND and PEREIRA, 2007).

Among so many attempts to resolve these issues, there was also the possibility of creating a plant between Brazil and France, on the border, more precisely, in the municipality of Oiapoque. However, even so, the consumption between the two localities comprising Oiapoque and French Guiana, would be too low to attract large investments. Consequently, the intention was to supply energy through natural gas, extracted from the Urucum field, in Amazonas.

However, to support yet another consumer, such as Amapá, it would have to increase its production, which apparently would not be a problem, nor its transport, but the construction of new thermoelectric plants for the consumption of natural gas and the generation of energy. through it, and the biggest obstacle, will be the high cost for installation. In this context, in the years 1995 to 1999, Amapá continued without the prospect of resolutions for energy strangulation. According to data from Drummond and Pereira (p. 94)

> ELETRONORTE's investment scales for 1995-1999 did not give any hope for Amapá to overcome its energy bottleneck in the near future: 61.8% of the investments of US $ 62.88 million were reserved for generation by existing plants; another 30.8% were allocated for maintenance and expansion of the subsection; the remaining 7.4% were reserved for studies and inventories. There was no provision for expanding the installed generation capacity. Thus, if Amapá depends on the reliable and cheap supply of electricity for its development, which seems to be inescapable, its prospects, at the moment, are diverse.

Filocreão (2013) presents a favorable environmental picture, regarding the availability of water resources, that this will undergo radical changes over the years, due to the lack of investments in infrastructure for hydroelectric projects. In other words, the production of electric energy in 1990 was 40 MW, in 1991, this capacity increased to 42 MW, however, studies in the same decade revealed that only in the Araguari river basin, there was a potential with both water and water viability. of 602 MW.

For this reason, Filocreão (2013) sparks a counter-sex discussion about the availability of financial resources. And it presents data on the growth of electric energy consumption in Amapá (557.8%), and highlights that this is well above the national (98.36%) and northern (176.4%) growth, in a period of 19 years, which ranges from 1991 to 2010. But in this segment, it highlights an environmental struggle, as this growth occurred through thermoelectric plants (7,200%) and hydroelectric plants only (83.3%).

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The consumption and generation of electric energy in the state of Amapá had a big jump in the period from 1994 to 2010, that is, in a space of 16 years there was a considerable notable evolution. According to Filocreão (2013, p. 62)

> (...) the production of electric energy in Amapá grew 557.8%, a growth, significantly greater than that which occurred in Brazil (98.3%) and in the North 176.4%). However, the energy generated by hydroelectric plants grew only 83.3% while the generation by thermoelectric plants, produced by burning fossil fuel, with a large emission of greenhouse gases, grew by 7,200%. According to Drummond and Pereira (2007), in 1994, the capacity of electric energy production in Amapá was 91 MW, 56% of which is generated by thermoelectric plants, with a use of 27.3 million liters of diesel oil at an approximate cost 5 million dollars, just for that year 1994.

These data reveal an important face of population growth in the state, which required a greater consumption of energy, however, to supply this product, the consumption of fossil fuel increased, to the detriment of the construction of hydroelectric plants.

According to Drummond and Pereira (2007) apud Filho (2010, p. 67), "(...) Amapá, in comparison with the other federated units, suffered one of the greatest population growths of the 1990s". This report shows the intensity of the problem in 2010, in which the electric energy originated by thermoelectric plants, in Amapá, was 219 MW, that is, 4.3 times more than that generated in 1994.

Concomitantly with the data above, the consumption of residential energy between 1994 to 2010 also increased, reaching a level of 448.4%, according to the IBGE. However, the highlight was rural energy, which grew, with a rate of change between 471.6%, through the number of connections.

Table 3 - Variation of Energy Consumption in Amapá (GWh)

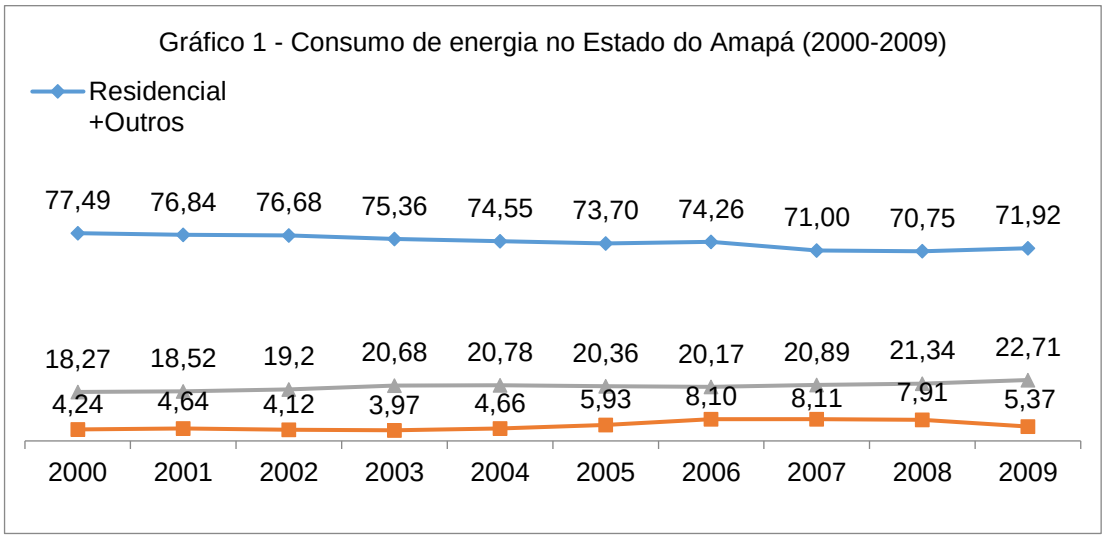
Typology of consumption	**GWh consumption**			**Variation (%)**
	1991	**2001**	**2010**	**1991-2010**
Residential	72.4	220.0	397.0	448.4
Commercial	26.0	83.8	180.0	592.0
Industrial	25.8	20.9	35.0	35.6
Rural	0.6	1.8	3.0	373.9
Others	49.2	123.8	171.0	247.4
Total	174.1	450.3	786.0	351.5

Source: Statistical Yearbooks of Amapá 1992,2002; Energy Yearbook (EPE) 2011

According to the data in Table 3, the greatest increase in consumption came from households, due to the considerable population growth, in the period between 1991 and 2010. Another factor to be highlighted is the energy consumption by the industrial sector, which had

a growth of only 35.6%, that is, it is a timid field that has developed little over the years in the state of Amapá.

It is also noteworthy that the viability of an energy consumption market is closely linked to the proportion of industrial consumption in Graph 1, it is observed that the proportion of residential and other consumers, where public services and rural energy fall, is greater than 70%.



Source: CEA / 2016

According to Eletronorte's Electricity Service Plan 2007/2016, Eletronorte's generation system, in Amapá, had an installed active disposition of 234.8 MW, of which 116.8 came from the Santana Thermoelectric Plant, from domain of this same generator, and 40 MW were contracted with the Independent Energy Producer GEBRA, totaling 156.8 MW.

As of 2009, after the end of the contract with the independent producer, the supplementary energy contracted by Eletronorte is sold by the company SOENERGY, totaling 45 MW, increasing the effective installed disposition from 234.8 MW to 239.8 MW, conceiving another increase in the capacity of thermoelectric generation (ARNALDO FILHO, 2010). Still in this light, it has to be stated that:

> [...] Companhia de Eletricidade do Amapá has its own generation system, fully thermoelectric, which has 17,123 MW of effective power, serving the Municipalities of Laranjal do Jarí, Vitória do Jarí, Oiapoque and the locality of Lourenço, in the Municipality Calçoene (CEA, 2006). Eletronorte's thermoelectric plants installed in the municipality of Santana are licensed by the State Secretariat for the Environment - SEMA. (SANTOS FILHO, 2010)

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In view of the lack of energy production and the isolation of the State in relation to the National Interconnected System - SIN, Companhia de Elétrica do Amapá - CEA, manages to take this product to the municipalities of the state. According to research, between 2000 and 2008, a large demographic explosion was noticed, which directly implied an increase in energy consumption, registered in the CEA figures.

Table 4 - Evolution of Losses and No. of Consumers in Amapá - 1991 to 2015

YEAR	1991	1999	2000	2015
Losses (MWh)	50,275	200,018	180,446	725,245
Losses (%)	22.40%	34.40%	29.50%	40.61%
Total Registered UC's	44,905	89,219	96,305	196,008
Registered Residences	39,874	80,660	87,232	173,284

Source: adapted from Arnaldo Filho (2010) updated until 2015 by the authors.

Table 4, referring to the loss of energy in the state and the number of registered consumers, shows that, in a space of 25 years, there was an increase of 334% in the number of homes registered with CEA, while the loss rate was an increase from 22.40% in 1991 to a percentage of 40.61% in 2015. An important conclusion is that as the supply of energy from thermoelectric plants increased, losses increased, which indicates little market efficiency. , arising from a disorderly growth in demand.

Such a phenomenon was already being evidenced by Santos Filho (2010) shows that the "Strong demand for energy generation, (...) which, in a state that still has a repressed productive capacity due to structural and environmental aspects" (SANTOS FILHO , 2010, p. 69). Among the structural aspects, the energy factor stands out as a source of restriction to growth and market viability.

' Mazagão, Porto Grande, Ferreira Gomes, Serra do Navio, Água Branca do Amaparí, Cutias, Itaubal do Piririm, Tartarugalzinho, Amapá, Pracúuba and Calçoene and has 10 generating units totaling 204.90 MW, as shown in the table below:

Table 5 - Productive potential of the Amapá energy park by 2015.

POWER PLANT	PLACE	UN No.	TYPE	FUEL	UNIT POWER (MW)	
					Nominal	Effective
UTE Santana	Santana	3	TG	Diesel oil	3 x 21.5	3 x 18.00
		4	GD	Diesel oil	4 x 15.60	4 x 15.60
			Total		126.9	116.4
HPP Coaracy Nunes	F. Gomes, Rio Araguari	3	KAPLAN		2 x 24.00	2 x 24.00
					1 x 30.00	1 x 30.00
			Total		78	78

GRAND TOTAL	204.9	194.4

Note: 1) TG - Gas Turbine; 2) GD - Diesel Slow Group. Source: Eletrobras Eletronorte

The Vale do Jarí region, which includes the cities of Laranjal do Jarí and Vitória do Jarí, was connected to the SIN on 05/18/2015. Before, its service was carried out through thermal machines rented from the Soenergy Company with an installed capacity of 16.836 mw of installed power.

The cities of Oiapoque, Clevelandia and Aldeia do Manga are served by Empresa Oiapoque Energia (independent producer) from 11/26/2015. Before, the Oiapoque region was serviced by thermal leased machines from the Soenergy Company of 7.196 mw of installed power. The Isolated System of the city of Lourenço, located in the municipality of Calçoene, is serviced by renting machines from the Soenergy Company.

In addition to the need to serve the Interior of the State, one must consider the strong growth of the urban structure in the city of Macapá whose expansion took place in a horizontal city with the appearance of numerous neighborhoods, such as: Brasil Novo, Marabaixo I, II and III, Infraero I and II, Renascer, Universidade, Liberdade, Ipê, Novo Horizonte, Goiabal, Pantanal, Açaí, Boné Azul. In the interior of the state, the result of population growth was also quite noticeable, with the emergence of new neighborhoods in Oiapoque, namely Antena, Usina, Oiapoquezinho and Pertinho do Céu.

In the municipality of Laranjal do Jarí, Agreste, Mirilândia, Nova Esperança, Sarney, Nazaré Mineiro and Cajarí emerged. In Porto Grande there was also expressive growth, represented by the appearance of the Airport neighborhood, one of the largest urban agglomerations in that Municipality (SANTOS FILHO, 2010). To supply the increasing population demand in Amapá, the thermoelectric plants start to produce more energy.

In addition, there is also the establishment of mining companies since 2004. However, the great indicator of investments made by Eletronorte was precisely the increase in the population.

> Despite having in its territory one of the largest hydroelectric potentials in the country, the fact that it is isolated from the national interconnected energy system - SIN transforms it into a state highly dependent on the increases in generation from thermoelectric generation. (SANTOS FILHO, 2010, p. 69).

The author makes it clear that the state has a potential energy producer, however, as it is not interconnected with the rest of the country, it ends up becoming dependent on thermoelectric plants and concomitantly impacting the environment, that is, “the thermoelectric matrix is fundamental for the service to the population of the State of Amapá, a

situation that can be considered quite worrying if evaluated from an environmental perspective ”(SANTOS FILHO, 2010, p. 70). Because, as energy consumption increases, so does the need to expand the terms, to the detriment of hydroelectric plants, which require large investments.

3. DISCUSSION AND RESULTS

In summary, the energy market in Amapá showed a behavior evidenced in three basic phenomena: 1) Increase in the population, conditioning the energy supply; 2) Expansion of energy production in thermoelectric matrix, to meet population growth; 3) Reduction in industrial consumption, given the unavailability of supply capable of supplying energy-intensive projects.

Despite studies that identified the existence of hydroelectric potential in the State in the 1990s and 2000s, these could only be made possible after the years 2005, concomitant with the need to meet the growing national demand for energy. In this sense, the energy bottleneck persisted until 2015, in a way that meant an important restriction to the growth of Amapá's economy.

Still on the water potential discovered in the 90s, 16 waterfalls were identified as located in distant locations and difficult to access, which would increase the cost of the works. It must be clear that even with the growing demand, conditioned by population and urban expansion, consumption in the State of Amapá is still low compared to other States, which in turn prevented the expansion of hydraulic production to meet only the local market. Thus, there could only be investments in this matrix if the final objective of the public policy was to serve the national market.

4 METHODOLOGY

Understanding that the methodology is the map to be followed to find the answers that surround the questions raised by the problem, is a fundamental factor to do a quality work, like this (MINAYO, 1994, apud SILVA E DURANTE, p191, 2009) say that "The methodology is the way to study thinking and practices in the exercise of reality, combining the techniques and the creative potential of the researcher."

This part of the study sought to describe the history of the energy sector in the state of Amapá, using data. As such, the research presents descriptive characteristics, observed through specific literature, having as main presentation, an exploratory bibliographic research.

Energy Supply and Demand in Amapá: Strangulation and Restriction to the Local Market. This was carried out through books, scientific articles and websites. According to Cervo, Bervian & Da Silva (p, 60, 2007).

> Bibliographic research seeks to explain a problem based on theoretical references in articles, books, dissertations and theses. It can be carried out independently or as part of descriptive or experimental research. In both cases, it seeks to understand and analyze the cultural or scientific contributions of the past on a given subject, theme or problem.

After the survey of the specific material to collect the information, it was read and recorded, as well as the content analysis. This entire process involved confronting information to examine its consistency. The understanding of the tables was another predominant factor in the understanding of the elements involved in the research. Subsequently to these procedures, the interpretation of the data and their confrontation with the hypothesis presented in this work began, and to see if they were divergent or convergent.

5 FINAL CONSIDERATIONS

This article made some considerations of the process of development of Amapá and structuring of its market from the data of consumption and supply of electric energy. An important conclusion is that the process of political autonomy did not consider the need for economic autonomy, as the State was created with an important bottleneck, which was aggravated by the emergence of the ALCMS.

The State, even without the prospect of plausible solutions regarding the supply of energy, as explained in this work, and due to the process of energy scarcity. It is noteworthy that between the years 1990 and 1994 there were numerous energy rationing. After studies of energy potential and the growth of national demand for energy, the state after 2005 became part of national policy objectives.

With this scenario, a new energy policy was established, the state became attractive for the installation of hydroelectric plants through concession through auctions; because, however expensive the works, the energy producing companies can export their product,

which allowed to overcome the limitation of the local market, since the integration with the Linhão de Tucuruí allows the sale of excesses in the SIN.

Finally, the energy bottleneck was overcome, but it imposed Amapá 25 years of isolation in a process of limiting industrial growth and reducing its growth potential. However, there is still a long way to go, as the energy distribution market is under the aegis of a new regulatory framework that implies the need for privatization of Companhia de Eletricidade do Amapá - CEA, the latter must be object of a study specifies what is not in the scope of this article. In 2017, when this study was developed, even after two years of interconnection to the SIN, there are still limitations to the market, due to the company's inability to provide the distribution service properly.

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