This scientific article was originally published in the Special Issue of the Brazilian Energy Journal (Volume Three - August 2021)

www.energiaeambiente.org.br | energiaeambiente@energiaeambiente.org.br

UNIVERSALIZATION OF ACCESS TO PUBLIC ELECTRICITY SERVICE IN BRAZIL: RECENT EVOLUTION AND CHALLENGES FOR THE LEGAL AMAZON

André Luís Ferreira[1]

Felipe Barcelos Silva[1]

[1]Institute of Energy and Environment (IEMA)

Overview

The 2000 Census of the Brazilian Institute of Geography and Statistics (IBGE) identified the existence of 2.5 million households without access to electricity. Of these, 80% were located in rural areas, totaling 10 million people. Based on this finding, the federal government created in 2003 the National Program for Universal Access and Use of Electric Energy – Light for All (Luz para Todos – LPT).

Since 2004, more than 3.5 million connections have been made, benefiting 16.8 million people, showing the undeniable advance provided by LPT. However, there are communities, located mainly in areas further away from the electrical distribution grid, which still do not have access to the public electricity service. A study prepared by the Institute of Energy and Environment (IEMA) estimated the number of people in this condition in the Legal Amazon at 990,000; just over 32% of them reside in indigenous lands, approved quilombola territories, conservation units and rural settlements.

An important part of this population is located in areas where low population density and geographic and environmental restrictions prevent the extension of electrical distribution grid. Thus, the offer of public electricity services should be made possible through small-scale decentralized generation. In order to bring electricity to remote regions of the Legal Amazon, the Federal Government launched in 2020 the "National Program for Universal Access to and Use of Electric Energy in the Legal Amazon – More Light for the Amazon (Mais Luz para a Amazônia - MLA)".

This article identifies some gaps in the Program's design and implementation and recommends the improvement of some issues: (i) dimensioning of generation systems so that they meet local production demands; (ii) articulation of the MLA with other sectorial policies; (iii) planning of installation and decommissioning logistics of generation systems; (iv) involvement of communities in the design, operation and maintenance of the systems and, (v) predictability of guaranteeing financing for universal access to electricity.

1. Introduction

Taking into account the Federal Constitution of 1988 and Law 12111/2009, which regulates the supply of electricity in isolated systems, access to electricity is a right of anyone who wants to obtain this service in Brazil. This right is guaranteed because electrification has the ability to expand

opportunities for social and economic change by enabling: residential and public lighting; the use of home appliances; telephony and the use of computers and the internet; the electrification of hospitals and health posts; schools and the improvement of production processes, that is, the use of machines capable of increasing the population's income level.

Although there is a legal basis for universalization, there is still a significant number of people without access to electricity, especially in the Legal Amazon. Thus, the purpose of this article is to contribute to the understanding of some of the challenges involved and to identify possible ways to face them.

Initially, a quick history of the implementation and results achieved by the Light for All Program is presented. Then, an analysis of the More Light for the Amazon Program is carried out in order to identify possible gaps in its formulation that could compromise its success. Finally, some actions needed to expand programs for universalizing access to electricity in remote areas of the Legal Amazon are presented.

2. Light for All Program

Although there have been previous efforts to universalize access to electricity in Brazil, in particular the State and Municipal Energy Development Program (PRODEEM)[1], as of 2002, with the creation of Federal Law 10438, electrical exclusion began to be tackled in a more structured manner in Brazil. This program created the right of all applicants to be served by public electricity services. The concessionaires and licensees of this service are now required to meet, without any cost to the consumer, connection requests that can be carried out through the extension of the grid in secondary distribution voltage, even if improvements in the primary grid are necessary.

In order to make universalization projects feasible without any cost to the consumer, the Energy Development Account (CDE) was created by the same law[2]. The funds come from annual payments made for the use of public property, fines applied by Aneel to concessionaires, licensees and authorized companies and, as of 2003, annual fees paid by all agents that sell electricity to the final consumer.

The National Electric Energy Agency (ANEEL) regulated the issue through Resolution no. 223/2003[3], defining rules for distributors to draw up Electric Energy Universalization Plans, which must be implemented by Service Expansion Programs, carried out annually until universalization is reached in all Brazilian municipalities.

Surveys from the 2000 Census of the Brazilian Institute of Geography and Statistics (IBGE) identified the existence of 2.5 million households without access to electricity. Of these, 80% were located in rural areas, totaling 10 million people. About 90% of the families residing in these rural households had an income of less than 3 minimum wages, corresponding to family farming, as this term has been applied in the country (IICA, 2011). Based on this exposition of reasons and supported by Law 10438/2002, the Federal Government implemented in 2003 the National Program for Universal Access and Use of Electric Energy – Light for All program (LPT)[4], with the purpose of anticipating the universalization of access in homes and rural places, which, under market conditions, would be in last place in the universalization plans.

---

[1]PRODEEM, created by the Federal Decree of Dec/27/1994, was in force until 2002, when it was incorporated into the Light for All Program.

[2]In addition to promoting the universalization of electricity service, CDE was created with the aim of (i) ensuring resources to provide affordable tariffs to low-income consumers and (ii) promoting the competitiveness of electricity produced from wind, solar thermal sources, photovoltaic, small hydroelectric plants, biomass, other renewable sources and natural gas (incentivized sources).

[3] Available at res2003223.pdf (aneel.gov.br).

[4]Federal Decree No. 4873/2003

The original target of two million connections was met in 2009, basically through the extension of the electrical distribution grid. Since the IBGE census of 2010 indicated the existence of new families without access to electricity, the program was extended to the period 2011-2014. In fact, throughout the execution of the Program, new families were identified, causing it to be extended twice (2014 to 2018, and from 2018 to 2022).

By the end of the first half of 2020, the investments foreseen in the LPT totaled BRL 27.79 billion, of which BRL 16.82 billion had already been released to the executing agents[5]. Since 2004, more than 3.5 million connections have been made, benefiting 16.8 million people. In the urban area, all distributors in the country are universalized. In the rural area, 14 distributors continue to implement their Universalization Plans[6] .

These results show an undeniable advance provided by LPT. However, there are communities, located mainly in areas further away from the distribution grid, which still do not have access to the public electricity service. It is not by chance that approximately 70% of the connections planned in the Universalization Plans for 2021 are located in the states of the Legal Amazon[7] .

3. Electrical exclusion in the Legal Amazon

A study prepared by the Institute for Energy and the Environment (IEMA) estimated that there are 990,000 people without access to public electricity service in the Legal Amazon region; just over 32% of them reside in indigenous lands, approved quilombola territories, conservation units and rural settlements. Figure 1 shows the distribution of the population without access to electricity by state. Its location in the Amazon regions is shown in Figure 2.

Figure 1: Population without access to electricity in the Legal Amazon (2019)
Source (IEMA, 2020)

[5] https://eletrobras.com/pt/Paginas/Luz-para-Todos.aspx. Accessed on March 30, 2021.
[6] https://www.aneel.gov.br/universalizacao. Accessed on March 30, 2021.
[7] Ordinance 342/GM of Sep/14/2020. Available at http://antigo.mme.gov.br/c/document_library/get_file?uuid=4fad07f4-f548-78e4-2fc9-6dcf40767742&groupId=36156 Accessed on April 10, 2021.

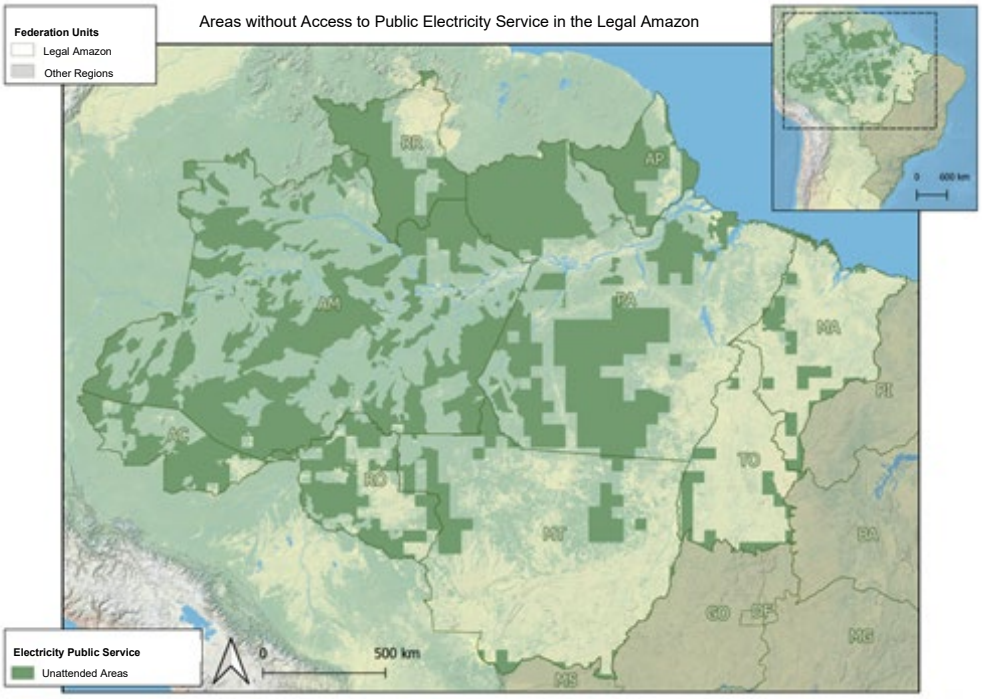

Figure 2: Areas without access to electricity in the Legal Amazon (2019)
Source: (IEMA, 2020)

With the exception of locations connected to the National Interconnected System (SIN), the formal supply of electricity in the Legal Amazon is structured through auctions, in the case of standard Isolated Systems (SISOL)[8] or through the LPT Program in remote regions (IEMA, 2018).

The isolated systems are composed of 269[9] generating units, located mainly along the rivers, close to the urban areas of the municipalities, as illustrated in Figure 2.

The portion of the population without access to public electricity services located closer to these systems must still be served through the expansion of the distribution grid, given that there are institutional and procedural mechanisms for this. Each year, the distributors submit the electricity market projections in each isolated location, balanced between supply and demand for the next five years, the future needs for expansion or replacement of current plants, connections of locations to the SIN, etc. for analysis by the Energy Research Company (Empresa de Pesquisa Energética – EPE) and approval by the MME,

[8]Decree 7246/2010 (art.2, III) defines isolated systems as *"electrical systems of public electricity distribution service that, in their normal configuration, are not electrically connected to the SIN, for technical or economic reasons*." The same decree (art.2, II) defines remote regions as "small groups of consumers located in an isolated system, far from municipal headquarters and classified with the absence of economies of scale or density.

[9]The number of Isolated Systems may vary each year, either due to interconnections to the SIN or due to the presentation of new locations by the distributors. Of the 269 locations, 45 are expected to connect to the SIN by 2024 and another 13 after this period (EPE, 2020).

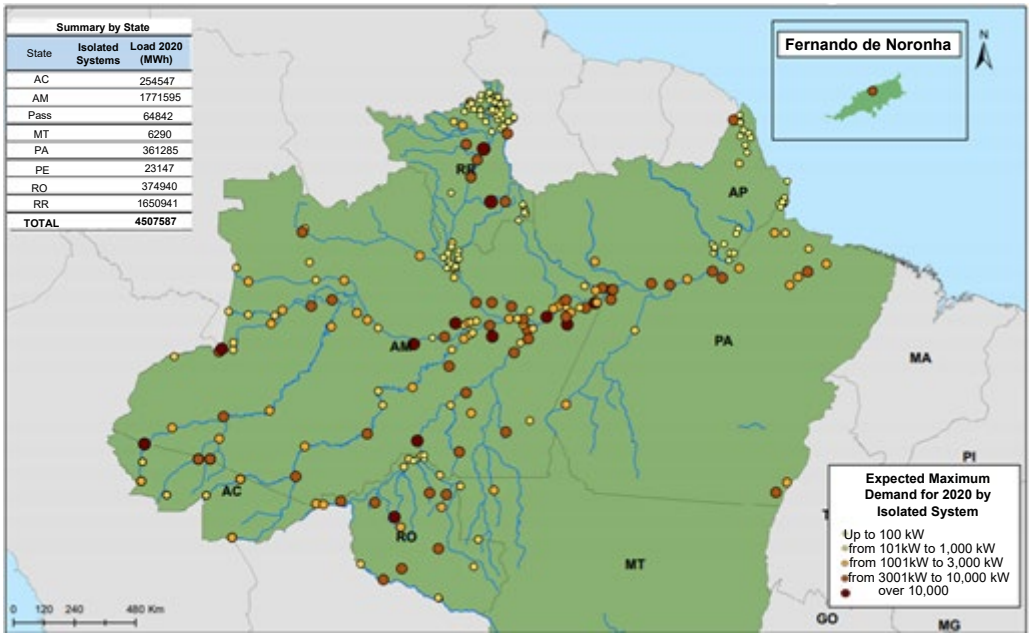

Figure 3: Location of Isolated Systems in the Legal Amazon (2019)
Source: (EPE, 2020)

As for remote regions, where low population density and geographic and environmental restrictions prevent the extension of the grid, communities do not have electricity or have small diesel or gasoline generators. They are small, costly and precarious generation units that are not regulated by the electricity sector and do not have institutional subsidy mechanisms. Given that family income in these communities is very low, the economic impacts are considerable. There is no forecast of expansion of SISOL to remote regions, thus, the offer of public electric electricity services should be made possible through small decentralized generation: individual electricity generation systems (SIGFIs) or isolated micro-systems of generation and distribution of electricity (MIGDIs).

4. Remote regions and the More Light for the Amazon Program

In order to bring electricity to remote regions of the Legal Amazon, the federal government launched in 2020 the "National Program for Universal Access to and Use of Electric Energy in the Legal Amazon – More Light for the Amazon (Mais Luz para a Amazônia)". As with the LPT, the connections to be made will not result in any burden for the beneficiaries, being financed with funds from the CDE.

The Program foresees both the connection of communities that do not yet have access to electricity, as well as the replacement of diesel or gasoline generators. Despite considering several technology options (Solar, Wind, Water, Biomass), MME has signaled a preference for photovoltaic systems (MME, 2020).

The service priorities of the More Light for the Amazon Program are: (i) low-income families registered in the Federal Government's Single Registry for Social Programs; (ii) families benefiting from federal, state or municipal government programs aimed at social and economic development; (iii) rural settlements; indigenous communities, quilombola territories and other communities located in extractive reserves or directly impacted by electricity generation or transmission projects whose responsibility is not the utilities'; (iv) schools, health stations and community water wells; and (v) families residing in protected areas.

As with the LPT, distributors must raise the demands of their area of operation, prepare and implement the Works Program in accordance with the criteria set out in the Operational Manual of

the More Light for the Amazon Program (MLA). Eletrobrás is liable for carrying out technical and budgetary analysis of the Works Programs, whose approval is up to the MME (MME, 2020).

According to ANEEL, surveys carried out by the MME in the first half of 2020 indicated the need for just over 78,000 connections under the MLA (ANEEL, 2020). As for the goals to be achieved by 2022, they were formalized through Terms of Commitment between the MME and the distributors, with the intervention of ANEEL, Eletrobrás and the Electric Energy Commercialization Chamber – CCEE. The commitments assumed will make, in the aggregate, 14,851 connections in 2021 and 15,633 in 2022, as shown in table 2.

Table 2: 2021/2022 targets for electricity distributors in the More Light for the Amazon Program

Distributor	State	2020	2021	2022	Total
Energisa Acre	AC	---	323	1045	1368
Amazonas Energia	AM	78	1296	3084	4458
CEA	Pass	---	678	1846	2524
Equatorial Maranhão	MA	---	1825	---	1825
Energisa Mato Grosso	MT	---	110	300	410
Equatorial Pará	PA	205	6248	4500	10953
Energisa Rondônia	RO	---	300	600	900
Roraima Energia	RR	---	3871	3872	7743
Energisa Tocantins	TO	---	200	386	586
Total		283	14851	15633	30767

5. Insufficiency of existing policies to ensure access to electricity in the Amazon

The proposition of a MLA Program exclusively oriented to remote regions of the Amazon represents, undeniably, another important step in efforts to universalize access to electricity in Brazil. However, there are some gaps in its formulation and in the initial steps already given that need improvement, as discussed in the following sections.

5.1 Sizing of systems so that they meet local production demands

Deforestation in the Legal Amazon has returned to rise consistently in recent years, reaching more than 11,000 km² in 2020[10]. It is not by chance that sustainable development in the region has been on the agenda of debates about the environment and the economy, both locally and globally. Representatives of foreign governments, development banks and investment funds have been pushing for effective policies for the region.

In this context, scientists, researchers, decision makers, politicians, social movements and local communities have advocated for the need for another model for the region's development. SIMÃO (2020, p.30) summarizes well what the general characteristics of this new model would be: *"The guiding principle in developing a forest economy and synergistic societies is not to see the region as a mere producer of primary commodities (agricultural, timber, minerals, etc.) for inputs from industries elsewhere, but having deep roots in the geosociobiodiversity of the Amazon region as a fundamental element and promoting benefits (social, economic, environmental) for the local population. These businesses should aim to develop a "green economy", equitable and socially inclusive, oriented towards biodiversity, harnessing the value of nature through market opportunities for sustainable products and services from the Amazon, its forests, ecosystems and societies".*

[10] http://www.obt.inpe.br/OBT/noticias-obt-inpe/a-taxa-consolidada-de-desmatamento-por-corte-raso-para-os-nove-estados-da-amazonia-legal-ac-am-ap-ma-mt-pa-ro-rr-e-to-em-2019-e-de-10-129-km2

The report prepared under the "Cooperation with the Amazon Fund/BNDES" Project, which addresses the ways to face social and environmental challenges in the Amazon, also pointed out, some years ago, the need to combine combating deforestation with valuing the "standing forest," generating jobs and income and conserving biodiversity (GIZ, 2012). There is a series of productive activities that can combine all these elements, such as, for example, the value chains of agroforestry products (nuts, cocoa, açaí, cupuaçú, vegetable oils, etc.) and fisheries.

The development of these different productive activities, normally based on concepts such as "Green Economy" or "Bioeconomy", still presents a series of challenges to be overcome. The availability of electricity for local production chains is one of these challenges. As pointed out by GIZ (2012, p.110), "*Processes for processing, transporting and especially industrializing products from the Amazon require greater availability of electricity (...) In rural areas, access to the electricity grid is even more limited, although there are considerable efforts to change this situation through the Light for All Program. The rural electrification capacity, however, is intended for domestic use and does not meet the electricity needs for processing and local industrialization of products."*

At first glance, the MLA Operational Manual seems to be right when it explains the focus of the Program: *"By focusing on the integration of actions from the various spheres of government, the Program focuses on the social and economic development of these communities, promoting activities aimed at increasing family income, with the sustainable use of the region's natural resources, and the consequent promotion of citizenship and the dignity of that population*" (MME, 2020, p. 4).

Nonetheless, the technical criteria established and the first referrals given to the Program show that, at least for now, it is limited, in practice, to the supply of electricity for the minimum needs of the communities, restricted to domestic use. Meeting demands greater than meeting basic residential needs, are not formally excluded from the Program, but, "*the minimum monthly electricity availability, proposed in the Works Program, will be evaluated by the MME".* In addition, Article 4, par. 1, of Decree No. 10221/2020; sets out that the MME will define the power that the electricity generation system will make available at the delivery point.

It should also be noted that any request to increase the power made available in the Program will be subject to the payment of the consumer's financial contribution. ANEEL, through a draft Normative Resolution to regulate the Program, proposes in its Article 5 that *"After the service provided by the More Light for the Amazon Program, the increase in available power will be subject to the payment of the consumer's financial contribution, pursuant to art. 30 of Normative Resolution No. 493 of 2012 and the provisions set forth in the General Supply Conditions*". In practice, it means that the distributor must meet, free of charge, only the request for increased load that can be carried out up to the monthly availability limit of 80 kWh per consumer unit.

Obviously, these technical criteria entail an excessive burden, putting at risk the possibility of offering electricity to meet the productive demands and, therefore, the economic development of the communities.

5.2 Articulation of MLA with other sectorial policies

Evaluating previous experiences of decentralized generation in the Amazon (Van Els, 2012) demonstrates that electrification needs to be part of a set of interconnected actions aimed at the development of the local community, requiring, therefore, the use of appropriate instruments for this purpose. Thus, Haaniyka (2006, p. 2978) evaluating rural electrification initiatives in developing countries, concludes that "*in order to achieve economic, social and environmental benefits, rural electrification must be integrated with development policies".*

In this regard, Decree No. 10.221/2020 that creates the MLA was right by specifying in Art. 1, par. 4 that *"The Ministry of Mines and Energy will articulate, with the other Ministries and with other bodies and entities that it deems convenient, the implementation of actions of socioeconomic development for which the availability of the public electricity service is required."*

Due to its cultural, economic and environmental diversity, the Amazon reveals a variety of products and production processes that are characteristic of local realities. As an input for planning the supply of electricity and establishing service targets in remote regions, it is essential to map these production chains and raise repressed electricity demands associated with them. This is a work that is not expected to be carried out by distributors alone. Thus, it is surprising that the Program has already defined service targets, without specifying the locations to be served, power/electricity to be made available, local production chains to be encouraged, etc. It seems that the established goals are only related to meeting the household demand, not taking into account the Art. 1, par. 4 of the decree that created the MLA.

It is expected that the planned articulation will be carried out, so that productive inclusion policies (financing, technical assistance, support for marketing, etc.) accompany the offer of public electricity services in remote regions and, thus, justify and offer conditions for the definition of the distributors' annual goals to incorporate the fulfillment of production demands. In the end, *"Rural electrification requires a broader vision and scope, far beyond the interests of utilities. Utilities sell electricity and are not development agencies."* (Van Els et al, 2012, p. 1452).

5.3 Planning of Installation and Decommissioning Logistics of Generation Systems

Ensuring access to electricity for remote communities in the Amazon, depending on the speed at which the process is to be undertaken, will require a continuous stable supply of components for generation systems (panels, batteries, etc.) and associated services. In addition, the decommissioning of these systems must be done properly, in order to avoid environmental risks in sensitive areas of the Amazon (e.g., battery disposal[11]). The dimensioning and treatment of these issues have not yet been part of the discussions on the regulatory process.

Brazil has a large part of the photovoltaic chain and offers several services related to the segment, such as project managers, system integrators, class associations, educational institutions, etc. However, meeting, in a coordinated manner, a program that proposes to install, annually, thousands of off-grid systems in remote areas of the Amazon is apparently still a task to be planned and made public by the MME and the distributors.

Distributors in northern Brazil already have some experience with decentralized generation projects from renewable electricity sources. However, it cannot be said with certainty that they are prepared to meet the demand for an effective program for the universalization of electricity in remote areas, especially if productive demands are taken into account.

It is worth remembering that equipment and service supply problems have already been experienced at LPT. As reported by IICA (2011, p.59), the Program *"created a demand for equipment much greater than usual, leading to two consequences, the first being a drop in the speed of implementation of the Program. Another consequence was that the prices of this equipment, due to this great increase in demand, increased in industries and material suppliers (...). Furthermore, the same pressure that occurred on the product market occurred on the services market. The high number of connections demanded caused a great shortage of labor to carry out electrical installations, assembly of equipment and others, leading to the need to create specific labor training programs for these purposes*.

[11]As the "More Light for the Amazon" program only allows services with renewable sources, electricity storage with batteries should play an important role in the systems to be installed.

5.4 Involvement of communities in the operation and maintenance of systems

It is necessary to take into account, again, the lessons learned in PRODEEM, which, from 1996 to 2003, installed about 9,000 photovoltaic systems, many of which failed or stopped operating due to lack of maintenance (Trigoso et al, 2010; Galdino, 2002; Copetti and Macagnan, 2007). In the state of Amapá, for example, 48 photovoltaic systems were installed in 11 municipalities between 1998 and 2003. Of these systems, 39 were unsuccessful, that is, 81.25% remained out of operation (Fonseca et al, 2016).

It is also worth mentioning an assessment audit of PRODEEM carried out in 2003 by the Federal Court of Accounts (TCU) which concludes, among other issues, the need for training and qualification of those responsible for the maintenance, monitoring and technical assistance of the systems, as well as greater involvement of communities and local governments in the Program (TCU, 2003). (Els, 2012), goes in the same direction when pointing out that participation of the local community in the design and execution of the systems, through associations or cooperatives, was an important factor for the most successful experiences in the Amazon.

Taking into account the first initiatives taken by the government so far with regard to the operation and maintenance of SIGFIs and MIGDs, at least those expressed in published documents, it cannot be said that the issue of long-term sustainability of the systems is well tracked.

5.5 Predictability of guaranteed financing for universal access to electricity

As already explained, universal access to electricity is one of the CDE's expenditure items, whose main source of revenue is the quotas paid by agents that sell electricity to end users. In 2019, these quotas contributed BRL 16.2 billion to the CDE, corresponding to 80.1% of its total budget (SEPAC, 2019). Given that the amounts of such quotas ultimately fall into the electricity tariff, there has been growing pressure from different sectors of the society to reduce CDE expenses.

In 2016, Law No. 13360 gave the Granting Authority the obligation to present a plan for the structural reduction of CDE expenses. More recently, the Ministry of Economy has taken a more forceful stance on the subject, warning "*to the fact that sectorial charges have increased their share in the electricity tariff, distorting the cost of this public service in Brazil. The existence of this distortion is harmful to the electricity sector as a whole, constituting one of the main causes of inefficiencies in this market, harming the competitiveness of electricity prices*" (SECAP, 2019, p.3). The same report also reads: *"By taking into account the substantial increase in charges and the benefits inherent in reducing them, it is considered relevant to open the debate on rationalization of charges* (SECAP, 2019b, p.21).

It is to be expected that the search for rationalization of CDE charges will open a dispute for funds between the various purposes of the CDE, putting at risk the availability of the amount needed to carry out the universalization programs. A sign that this risk is real has already been given both by Decree 9357/2018, which extended the LPT until 2022, as well as by the Decree that implemented the MLA Program, which explicitly conditioned the fulfillment of universalization goals to budget availability and financial statement of the CDE.

ANEEL submitted for public consultation a CDE budget proposal for 2021 in the amount of BRL 24.1 billion. In turn, MME defined for the same year a budget of BRL 1.14 billion for the LPT and MLA programs, i.e., 4.7% of the CDE. It is a small budget for a program created to pay off an important social liability in the country and, in 2013, it accounted for 14.6% of the CDE budget. In fact, a reassessment of priorities for the use of CDE resources is required. Figure 4, referring to the expenses in the year 2020, is very illustrative and can be very useful to support the debate.

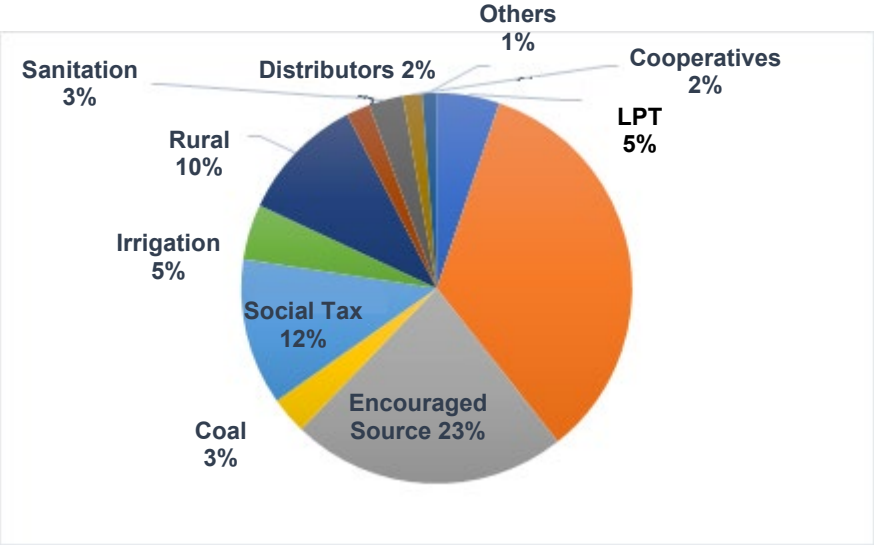

Figure 4: Energy Development Account Expenses in 2020

With specific regard to the Legal Amazon, the expenditure on Isolated Systems is noteworthy, which in 2020 reached BRL 7.49 billion, representing 34% of the CDE. As is well known, due to the high price of diesel and its transport logistics, the generation costs in these systems are much higher than those practiced in the SIN and their maintenance has been subsidized through the Fuel Consumption Account (CCC)[12], a sector charge, paid by SIN consumers from the Energy Development Account (CDE).

From 2013 to 2020, while the CCC had an increase of 85%, the budget for the Light for All Program was practically halved. It does not seem reasonable to restrict resources to ensure universal access to electricity and, at the same time, increase expenses to subsidize inefficient, expensive and polluting fossil fuel-powered generation units. Especially when there is still no plan and targets for replacing them, via auctions, with cleaner and lower-cost technologies.

6. Conclusions and Recommendations

The results achieved in the last two decades by efforts to universalize access to public service in Brazil are remarkable. However, it still cannot be said that the public policies existing in the country are sufficiently solid and articulated to ensure that, in remote areas of the Amazon, communities have access to electricity with the adequate quality and quantity to provide for the necessary local development. Bearing in mind the critical elements presented in the previous sections, the need for improvements in electricity universalization programs seems evident.

Meeting production demands

If the purpose is to promote the social and economic development of communities in remote regions of the Amazon, the decentralized generation desired in the MLA must be structured around systems capable of meeting local productive demands. Thus, programs for universalizing access to electricity must include the fulfillment of these community demands in the distributors' goals. Georeferencing with a view to visualizing existing demands and their spatial distribution is essential for the logistical planning and survey of universalization costs.

[12]Until 2012, this charge had a dedicated account, presenting its separate charge in the tariff of all consumers. From the enactment of Law No. 12,783 of January 11, 2013, CCC became an item of the CDE" (SECAP, 2019).

It is also essential to integrate the More Light for the Amazon Program with other government programs and policies that promote production chains and local development. As Van Els (2012, p. 1459) mentions it well, rural electrification *"is not about the dissemination or promotion of alternative technologies or creation of markets for modern electricity generation equipment, but the creation and application of instruments to support local development through rural electrification*."

Installation and decommissioning logistics

As explained above, expanding access to electricity in remote communities in the Amazon will require the continued supply of components for generation systems and associated services. In addition, the decommissioning of these systems must also be done properly. Thus, the planning of supply and decommissioning logistics of generation systems (photovoltaic panels, batteries, etc.) on the scale required to universalize access to electricity should be explained in the Distribution Works Plan.

Community involvement

Aiming at the long-term sustainability of the investment, the projects must be accompanied by training for the operation and maintenance of the generation systems. It is worth highlighting here one of the recommendations of the Symposium "Energy Solutions for Amazon Communities[13] ", held in 2019 in the city of Manaus and attended by 830 participants, including indigenous and community leaders from various states in the Amazon, representatives of the federal and state government, financial, industry and commerce sectors, research centers, organizations of the civil society, cooperation agencies, public managers, entrepreneurs and students: *"The expansion of service in remote regions must be accompanied by a robust training and qualification program for the management of electricity generation systems. Thus, it is also valid to carry out studies and consultations on the feasibility of operation and maintenance of electricity generation systems by communities or their associations".*

In addition to training, it is also important to highlight the need for community involvement in identifying the most appropriate technological arrangement for the characteristics of local production processes; "*...although it is positive to see solar photovoltaics as a priority technology, it is necessary to remember the concept of the most appropriate technology and the importance of preserving it in the case of the Amazon*" (IEMA, 2018, p. 52) This idea is reinforced by Van Els (2012, p.1459), when it is stated that *"Policies, programs and projects should start with an assessment of people's needs, rather than a plan to promote a specific technology. The needs of different rural communities vary widely, and finding appropriate technologies and effective implementation strategies can be very location-specific.*

Public Transparency

The rural electrification goals of electricity distributors must be submitted to public consultation before their definition by the MME, so that it is possible to know and discuss adopted criteria, schedules, etc. At this point, it is worth noting that ANEEL itself proposes that the goals of the More Light for the Amazon Program "*are submitted for discussion in the public consultation, in order to create opportunities for distributors and society in general to express themselves if this quantity can be adopted as an initial goal or if there is a need for revision. Thus, considering that this amount will only serve as an initial subsidy to the MME, it is estimated that the distributors must declare the existing demands in their area of operation during the public consultation itself...*". (ANEEL, 2020, p. 5).

Financing of universalization programs

[13] https://feira.energiaecomunidades.com.br/. Accessed April/15/2021.

Undoubtedly, it is necessary to review the priorities given to the various purposes of the CDE, aiming at recovering its social purpose, by ensuring the necessary resources to carry out the universalization programs.

There are expenses at the CDE that, perhaps, are not justified and, based on a debate with society, could be reduced, redirected or eliminated. An example, specific to the Legal Amazon, would be to redirect part of CCC's resources to finance access to electricity in communities located in remote regions. Therefore, it would be necessary to gradually and responsibly reduce the subsidies granted to the generation units of the isolated systems that use fossil fuels. The replacement of these units could be sought during the auctions, as long as they offer the necessary conditions for cleaner and lower cost technologies.

7. References

ANEEL – AGÊNCIA NACIONAL DE ENERGIA ELÉTRICA. **Nota Técnica 0030/2020-SED/SRG/ANEEL**. Brasília:2020, 9 p.

COPETTI, J.B.; MACAGNAN, M.H. **Baterias em Sistemas Solares Fotovoltaicos**. In I Congresso Brasileiro de Energia Solar. Fortaleza:2007

ELS, R.H., VIANNA, J.N.S., BRASIL JR., A.C.P. **The Brazilian experience of rural electrification in the Amazon with decentralized generation – The need to change the paradigm from electrification to development.** In Renewable and Sustainable Energy Reviews 16, p.1450–1461, 2012.

EPE – EMPRESA DE PESQUISA ENERGÉTICA. **Planejamento do Atendimento aos Sistema Isolados Horizonte 2024 – Ciclo 2019**. Rio de Janeiro:2020, 55p.

FONSECA, C.S.; MONTEIRO, F; BRITO, A.U. **Implantação de Sistemas Fotovoltaicos em Comunidades remotas no Estado do Amapá: A Política Pública, Desafios e Possibilidades. In Congresso Brasileiro de energia Solar**. Belo Horizonte:2016.

GALDINO, M.A.; LIMA, J.H.G. PRODEEM – **The Brazilian Programme for Rural Eletrification using Photovoltaics**.

GIZ – COOPERAÇÃO ALEMÃ PARA O DESENVOLVIMENTO SUSTENTÁVEL – Relatório do Projeto "Cooperação com o Fundo Amazônia/BNDES. **Oportunidades de Apoio a Atividades Produtivas Sustentáveis na Amazônia**. Brasília: 2012, 200 p.

HAANYIKA, C.M. **Rural electrification policy and institutional linkages.** In Energy Policy 34, p. 2977-2993, 2006.

IEMA -I NSTITUTO DE ENERGIA E MEIO AMBIENTE. **Acesso aos serviços de energia elétrica nas comunidades isoladas da Amazônia: mapeamento jurídico-institucional.** São Paulo: 2018, 71 p.

IEMA -I NSTITUTO DE ENERGIA E MEIO AMBIENTE. **Exclusão Elétrica na Amazônia Legal: Quem ainda está sem Acesso na Amazônia Legal.** São Paulo: 2020, 36 p.

IICA – INSTITUTO INTERAMERICANO DE COOPERAÇÃO PARA A AGRICULTURA. **Universalização de Acesso e Uso da Energia Elétrica no Meio Rural Brasileiro – Lições do Programa Luz para Todos.** Brasília: 2011, 91p.

MME – MINISTÉRIO DE MINAS E ENERGIA. **Manual de Operacionalização do Programa Mais Luz Para a Amazônia**. Anexo à Portaria Nº 244/GM, 16/06/2020. Brasília: 2020, 19p.

SECAP – Secretaria de Avaliação, Planejamento, Energia e Loteria do Ministério da Economia. **Conta de Desenvolvimento Energético: Subsídios Públicos ou Cruzados**. In Boletim Mensal sobre os subsídios da União. Brasília:2019, 14p.

SECAP – Secretaria de Avaliação, Planejamento, Energia e Loteria do Ministério da Economia. **Visão da SECAP sobre o Setor de Energia**. Brasília:2019, 24p.

SIMÃO, M.A.R.S. **O papel da Universidade na Amazônia na geração de Conhecimento para Estimular a economia da Floresta**. In Revista Interesse Nacional, Ano 13, Edição Especial 01-Bioeconomia, p.26 – 30.

TCU – TRIBUNAL DE CONTAS DA UNIÃO. **Avaliação do TCU sobre o Programa Energia das Pequenas Comunida**des. Brasília; 2003, 21 p.

TRIGOSO, F.M; QUAGLIA, R.B.; MORAES, A.M.; OLIVEIRA, S.H.F. **Panorama da geração distribuída no Brasil baseada no uso da tecnologia solar fotovoltaica**. In Revista Brasileira de Energia Solar, V.1; N.2, p.127-138, 2010