Disputes and narratives on the distributed generation of electricity in Brazil: setbacks for the 2030 Agenda for sustainable development and the Paris Agreement

Disputas e narrativas sobre o marco da geração distribuída no Brasil: retrocessos para a Agenda 2030 e o Acordo de Paris

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ABSTRACT

Centralization and low diversification of the Brazilian electricity matrix have increased the feeling of energy insecurity. In the face of climate change, this problem is gaining greater proportions. The present research analyzed the political arena around the regulation of distributed electricity generation to clarify expansion obstacles. To this end, documents, speeches, interviews, presentations, audiovisual material, and press publications about the country's distributed generation and solar power were analyzed. Results indicated that, despite the great development potential of the source in the country and the international commitments signed, the identified coalitions dispute narratives that result in setbacks for climate and sustainable development agendas.

Keywords: Aneel. Solar energy. Decentralization. Sustainability Agendas.

RESUMO

A centralização e a baixa diversificação da matriz elétrica brasileira aumentaram a sensação de insegurança energética no país, um problema que ganha proporções ainda maiores diante das mudanças globais do clima. Esta pesquisa analisou a arena política em torno da regulamentação da geração distribuída de energia elétrica a fim de elucidar os entraves à sua expansão. Para tanto, foram analisados documentos, discursos, entrevistas, apresentações, material audiovisual e publicações na imprensa sobre a geração distribuída e a fonte solar no país. Os resultados da pesquisa indicaram que, apesar do grande potencial de desenvolvimento da fonte no país, e dos compromissos internacionais firmados, as coalizões identificadas disputam narrativas que resultam em retrocessos para as agendas do clima e do desenvolvimento sustentável.

Palavras-chave: Aneel. Fonte Solar. Descentralização. Agendas da sustentabilidade.

1 INTRODUCTION

Solar energy is an inexhaustible source of resources, which presents great electrical potential in Brazil, a country possessing extraordinary levels of solar irradiation, even in less sunny locations (JEAN *et al.*, 2021; PEREIRA, 2017). However, although the installation of photovoltaic systems has represented a 33% increase over the years 2019 and 2020, public policies and regulation standardization on the use of the solar source have not yet been able to reach the Brazilian generation potential. This gap has been discussed since the Brazilian Electricity Regulatory Agency (Agência Nacional de Energia Elétrica – Aneel) Normative Resolution (NR) Nº. 482/2012.

From NR Nº. 482, consumers have been authorized and encouraged to generate their own energy by installing photovoltaic systems. With the resolution, the surplus production returned to the public distribution network, converted and compensated in credits in the consumer's electricity bill. This surplus was injected and stored back into the grid for use by other nearby consumers, operating as a battery for these systems. Every 1 kW/h produced by the consumer's system was offset by 1 kW/h from the distribution network.

The rules established in NR Nº. 482 underwent two revisions until 2017. The first aimed to readjust and update the electrical capacities supplied by Distributed Generation (DG) in the country, resulting in NR Nº. 687/2015. The second review, in 2017, gave rise to NR Nº. 786, which updated the definitions of distributed minigeneration and the framework for distributed microgeneration or minigeneration. The third revision began in 2018 (RUBIM, 2021), and its process was marked by polarized discussions between supporters of the advancement of solar energy in Brazil and opponents of the incentives generated by the Electrical Energy Compensation System (EECS) introduced by the respective regulation (Figure 1).

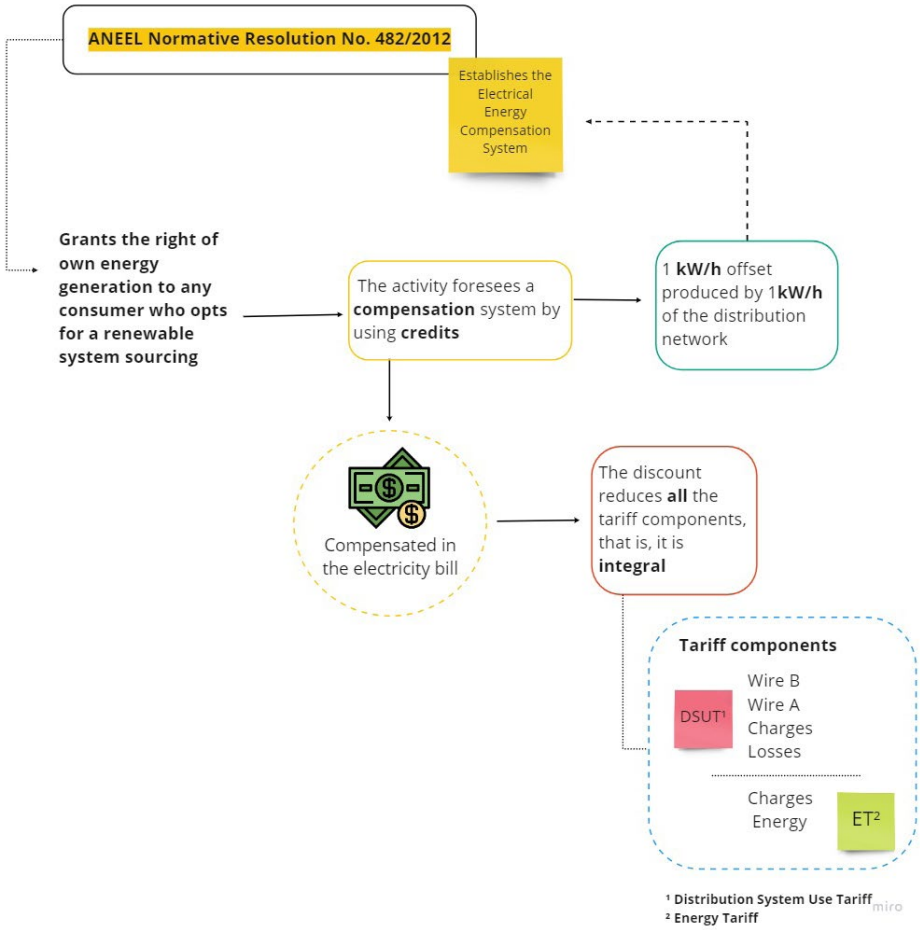


Figure 1 | Summary diagram of the main rule established by Aneel NR No. 482/2012

Source: Own elaboration.

Despite the advances provided by NR Nº. 482, as of 2015, questions have emerged about the form of compensation provided by the EECS, mainly because this system does not consider the costs of the "use" of the utilities' network. From this, Aneel elaborated six proposals for revising the normative, presenting setbacks concerning the NR. In light of this, the electric sector and civil society have mobilized around the social and environmental benefits that the expansion of the sector offers to society. The debate went to the National Congress as Bill of Law Nº. 5829.

In January 2022, the subject was discussed definitively, giving rise to the regulatory framework for distributed generation. Law 14300/2022 established a partial compensation system in which the consumer will pay for the surplus injected into the grid. However, the law allows all photovoltaic systems installed before January 2023 to enjoy the old EECS rules until 2045.

Based on this, this paper aims to describe the political arena, the narratives and disputes that influenced the regulatory framework for distributed generation in Brazil and its interaction with the 2030 Agenda for sustainable development and the Paris Agreement.

2 METHODOLOGY

The data analysis of this work was based on two stages: i) gathering of written and audiovisual materials on the subject of solar energy in Brazil; ii) characterization, positioning, classification and division of the actors based on their main agendas and arguments.

The gathering of materials sought to understand the context of the discussions about the issue and to subsidize the identification of the main arguments and groups active on the matter. The more than 80 materials collected on the *internet* contained positions and statements about DG and solar sources between 2018 (Third revision of NR Nº. 482) to 2022 (DG regulatory framework in Brazil - Law 14300). These materials were fully transcribed for identification, classification, and analysis in this paper.

The collected materials made it possible to identify the positioning and arguments presented by each actor in the materials. Throughout the analysis, 80 actors were identified and based on the criterion of highest Absolute Frequency (AF) of citations in the collected materials, seven were prioritized for analysis in this study, namely: (i) Aneel; (ii) Prosecution Office (Ministério Público – MP); (iii) Brazilian Photovoltaic Solar Energy Association (Associação Brasileira de Energia Solar Fotovoltaica – Absolar); (iv) Federal Court of Accounts (Tribunal de Contas da União – TCU); (v) Civil Society – Free Solar Organization (Movimento Solar Livre Association – MSL), National Institute for Clean Energy (Instituto Nacional de Energia Limpa e Sustentável – Inel), Climate Observatory (Observatório do Clima – OC) and Revolusolar Foundation; vi) Chamber of Deputies – Congressmen Beto Pereira, Rodrigo Agostinho, Lafayette de Andrada and Marcelo Ramos; and vii) the President of the Republic, Jair Messias Bolsonaro.

Based on the reading of the analyzed materials, two main groups were identified: i) in favour of the rules of NR Nº. 482; or ii) against the rules of NR Nº. 482. From this point, these actors were described in their respective groups and main arguments.

3 RESULTS

3.1 CHARACTERIZATION, POSITIONING, CLASSIFICATION AND DIVISION OF THE ACTORS

3.1.1 BRAZILIAN ELECTRICITY REGULATORY AGENCY (ANEEL)

Aneel is a special regime autarchy linked to the Ministry of Mines and Energy (MME), which aims to regulate the Brazilian electricity sector (ANEEL, 2022), including the DG and distributed microgeneration modalities.

Aneel established the general conditions for distributed generation in 2012, with NR Nº. 482. This regulation allowed the connection of a self-generation system from renewable sources to the distribution networks of the utilities. This process marked the advance of solar energy in Brazil. In 2015, Aneel revised the normative and applied new rules that further boosted the use of the solar source in the country, giving rise to NR Nº. 687/2015.

However, despite the update working as an incentive policy for solar energy in Brazil, the Resolution already foresaw the revision of these rules. Therefore, in 2018 Aneel started the third cycle of revising the regulations of Nº. 482 and Nº. 687 to reevaluate the established rules.

From these debates, Aneel prepared six proposals to amend NR Nº. 482 and opened a Public Consultation (PC) Nº. 10/2018 to discuss the proposals presented. The debate generated a Regulatory Impact Assessment (RIA) – Nº. 04/2018 – which culminated in several public hearings, recommendations and studies about the EECS.

In 2019, Aneel opened a new PC – Nº. 025/2019 – with preliminary wording for the Resolution. The wording followed proposal Nº. 6 – the most stringent option for EECS – and differed from the main discussions and recommendations of the previous PC. In this proposal, the EECS would compensate 1 kW/h produced by the consumer for 0.3 kW/h injected into the distribution network.

Industry players and civil society did not accept the PC and the proposal presented. In turn, Aneel did not legitimize the arguments presented and positioned itself against maintaining the current EECS established by its own regulation Nº. 482 of 2012.

3.1.2 PROSECUTION OFFICE (MP)

The MP has an independent and autonomous role, assured by the Federal Constitution, in subjects of public interest.

In October 2019, the MP intervened in the Aneel review process by establishing an Administrative Procedure (AP). The AP intended to "monitor and examine the regularity (...) of Public Consultation Nº. 025/2019, which aims to revise Resolution Nº. 482" (MPF, 2019). As a result, the MP requested clarifications about the revision from the MME and Aneel. Furthermore, in a complementary way, it requested Absolar a study on the losses generated for society from the changes proposed by Aneel (MPF, 2019).

In November 2019, the MP issued seven official recommendations to Aneel. In the document, the MP emphasized the public administration's duty and responsibility in situations of abuse of regulatory power, which may favour economic groups, cost increases without proof of direct benefits, and interfere with the arrival of new competitors in the markets.

The MP judged the rules established by NR Nº. 482/2012 as "a pioneering and fundamental regulatory framework for the development of the distributed microgeneration and minigeneration electricity sector" (MPF, 2019), being a driver of an industry that is a creator of jobs, development, and independence of electricity supply.

About the EECS established by NR Nº. 482, the MP pondered that the rule enables electricity generation without needing public capital investment. In addition to being able to "pulverize in the national territory, the generation of distributed, clean, inexhaustible and environmentally friendly electricity" (MPF, 2019). Also, according to the MP, "the system is invaluable for fostering an activity that aims at the independence of civil society, even if partial, in relation to public services" (MPF, 2019).

The MP also recognizes that the solar source is:

> a fully renewable, inexhaustible, alternative source for the challenges of expanding energy supply. Especially with regard to low environmental impacts and the desire for diversification of the Brazilian electricity matrix (MPF, 2019).

In addition to also recognizing the benefits of distributed generation, which rely on the production of energy nearby consumption, reduced use of thermoelectric plants and transmission lines, reduced pressure on distribution networks, and "minimizes investments in generation, transmission, and distribution of electricity, in addition to reducing losses" (MPF, 2019).

Finally, the MP understood that the new proposal would generate legal uncertainty for investors, consumers, and individual and collective losses. Furthermore, the MP also alleged that Aneel's new proposal is divergent from Brazil's National Energy Policy – Law Nº. 9478 of 1997.

The MP positioned itself in favour of maintaining the rules established in NR Nº. 482/2012 by recognizing the social, economic, and environmental advances that this type of generation promotes.

3.1.3 BRAZILIAN PHOTOVOLTAIC SOLAR ENERGY ASSOCIATION (ABSOLAR)

Absolar was a protagonist in the discussions about the theme, represented by Bárbara Rubim – Vice-President of Distributed Generation –and Rodrigo Lopes Sauaia – Executive President. Absolar's participation brought recommendations to Aneel with technical, economic, social, and environmental analyses on the contributions of solar energy to society (SAUAIA, 2021).

According to Absolar, the photovoltaic sector has generated more than 233,000 jobs for Brazilians and has moved more than 39.8 billion reais in new investments since 2012. In public terms, the sector collected more than 11.6 billion reais in taxes and avoided the emission of more than 1.1 million tons of carbon dioxide gas (BAITELO, 2021).

In light of this, Aneel refused to assess the arguments presented as it did not consider the issue within Aneel's regulatory competence. From this, Absolar and other interested parties have mobilized for NR nº. 482 to become a Bill of Law in the National Congress. The proposal sought a milder change than the one presented by Aneel.

Since the debates onset, Absolar has also positioned itself in favour of establishing a regulatory framework for the sector, which would generate more legal certainty for its development. According to Rodrigo Sauaia:

> Solar energy is a technology [...] that creates jobs and develops new projects, attracting new investments and not dependent on public sector investments. The DG, for instance, is a decision from the consumer.

> It is the consumer him/herself who invests in solar energy and undertakes this investment, irrigating the economy of the country and his/her own economy in terms of electrical energy. And the saving of this resource [...] will be used in the application of other consumptions, such as food, health, education, which are injected in the economic recovery of the country (SAUAIA, 2021).

Absolar is in favour of maintaining the rules established in NR. 482/2012.

3.1.4 FEDERAL COURT OF ACCOUNTS (TCU)

The TCU "is an external control body of the federal government, which monitors the country's budgetary and financial execution" (TCU, 2022).

The TCU enters the debate on NR Nº. 482 from the MP's request for clarification on possible Aneel violation of legal certainty and good faith of public consultation instated in 2019.

The MP's representation requested that Aneel freeze the public consultation process until the body can judge the issue. At the time, the TCU understood that there was no merit in the precautionary concession. However, it saw the request as an opportunity to "exercise control over a sensitive issue for the electricity sector.

Based on the studies presented by the requested parties, the TCU dismissed the MP's representation and judged the PC in question as "regular and under the principles of legality, legitimacy, reasonableness, legal certainty and good faith". (TCU, 2020).

The court recognized the importance of the EECS contained in NR Nº. 482/2012 for the advancement of distributed mini and microgeneration in Brazil, however, they identified:

> a cross-subsidy policy among electricity consumers of a regressive nature in terms of the income distribution, which has put pressure on the tariff of consumers with lower purchasing power and made spending by consumers with higher income less expensive (TCU, 2020).

In addition to the argument about the expenses with the EECS, the TCU also raised the hypothesis that NR Nº. 482/2012 breaches the General Law of Concessions by authorizing the tariff differentiation for electricity consumers with DG and those who do not. The agency alleges discriminatory treatment of consumers and illegal instruments of regulation. It also reports that the current system "generates negative externalities for other consumers and the electric power utilities" (TCU, 2020), generating economic inefficiencies and going against the precepts of social justice. According to the report, these factors become a "death spiral" for power distributors, as they compromise the future revenue collection of the distributors (TCU, 2020).

The report also requested that the information in the process be shared with the Chamber of Deputies, the Federal Senate, and other authorities involved in the discussion of bills going through the National Congress.

The agency considered unfounded the representations presented and determined the removal of the tariff differentiation present in NR Nº. 482/2012. Thus, the agency is against maintaining the current electrical compensation system established by NR nº. 482.

3.1.5 CLIMATE OBSERVATORY (OC)

The OC is a coalition of major civil society organizations created in 2002 to discuss the effects of climate change.

The OC also engaged in the debate to maintain the rules contained in NR nº. 482. It also emphasizes the importance of society and organizations' engagement in favour of solar energy advancement, as highlighted in the following excerpt:

> [...] the population, public opinion, has to be very mobilized to demand from the government that Brazil realize its energy and climate potentials and be an example to the world, which would also do a lot of good for our economy and each of us Brazilians (ASTRINI, 2022).

According to the OC, Brazil stands out for its capacity to generate solar energy precisely because it has great potential due to the high level of irradiation the country receives all year round (ASTRINI, 2022). Despite this, Márcio Astrini, executive secretary of the OC, states that investments and public policies for the theme are lacking (ASTRINI, 2022).

3.1.6 NATIONAL INSTITUTE FOR CLEAN ENERGY (INEL)

Inel "is an intelligence centre to support efforts for clean and sustainable energy sources" (INEL, 2022). Moreover, it aims to "promote the democratization of access to clean and cheaper energy to the whole society" (INEL, 2022).

According to Rodrigo Pinto, an Inel consultant, if the normative update were to be implemented, solar investments in Brazil would become economically unfeasible and legally uncertain. According to Rodrigo, "it is shameful for Brazil the contribution of solar today, in relation to the contribution of other more expensive sources, such as nuclear and fossil" (PINTO, 2021).

Concerning EECS, the Inel consultant clarifies that "an intelligent public policy would be a public policy that encourages the DG producer to insert its energy in the local distribution network" (PINTO, 2021), given its various economic benefits, both in terms of production, distribution and electricity losses. For Rodrigo, the revision of the normative and the approval of Aneel's proposal No. 6 "takes a path contrary to an intelligent public policy because it tries to limit Brazilians to invest in solar panels" (PINTO, 2021).

3.1.7 FREE SOLAR ORGANIZATION (MSL)

MSL is an Association representing several companies in the sector, faculty and student collectives, and society itself. Its main goal is the "democratization of clean and renewable energy in Brazil and free access to solar energy" (MSL, 2022).

MSL has engaged in the issue by seeking to disseminate the review proposals and broadening society's participation in discussions on the topic. MSL has declared itself against Aneel's proposal Nº. 6, translated as against "taxing" the sun. From the social engagement promoted, the expression "taxing the sun" became the great slogan of the trend against Aneel's revision.

According to MSL, "taxing the sun" "is absurd, since solar energy has such a low penetration in Brazil" (NETO, 2021) and is not justifiable, especially in light of a law for universal access to energy.

3.1.8 REVOLUSOLAR FOUNDATION

Revolusolar Foundation is "a non-profit association [...] that has the purpose of promoting the sustainable development of low-income communities through solar energy" (REVOLUSOLAR, 2022).

Revolusolar classified the proposal presented by Aneel as: "absurd, which taxes by about 60%, bypasses the industry's contributions and puts at risk the legal certainty and regulatory predictability of those who have invested in the DG segment since 2012" (REVOLUSOLAR, 2021). In addition, the Foundation also exposes unease about the investments and subsidies applied to fossil fuels and "large plants that are harmful to the environment and communities" (REVOLUSOLAR, 2021).

Faced with the implications that the change in NR Nº. 482 could generate in the sector, the Foundation engaged in the movement "#TaxarOSolNão" (#NoTaxingTheSun) and stood out to civil society as an active agent.

3.1.9 CHAMBER OF DEPUTIES

The Chamber of Deputies received the registered requests for a Bill of Laws to transform NR Nº. 482 into a specific law and, during the debates, received more than 100 drafting proposals, parliamentary amendments, and other documents referring to the matter. The various protocols presented proposals for the officialization of the EECS as established by NR Nº. 482 and for the institution of stricter forms of charging for distributed generation users.

In this debate of almost four years, the deputies Silas Câmara, Marcelo Ramos, Lafayette de Andrada, Beto Pereira and Rodrigo Agostinho had the greatest prominence in the discussions.

Congressman Silas Câmara, affiliated with the Republican Party for the State of Amazonas, was the author of the Bill of Law 5829/2019. The initial proposal sought to "Establish the legal framework for distributed microgeneration and minigeneration, the EECS and the Social Renewable Energy Program (Programa de Energia Renovável Social – PERS)" (BRASIL, 2019). According to Silas, the Bill of Law has the potential to "save another 300 billion reais in terms of investment [...] and create more than a million jobs in Brazil" (CÂMARA, 2021). In addition, the deputy believes in the investment power that the regulatory framework can bring to entrepreneurs in terms of solar panel manufacturing and in relation to creating new jobs.

The negotiations in the Congress about Bill of Law 5829 have started to become more frequent since the discussions have advanced. Then, in 2021, Congressman Lafayette de Andrada was appointed rapporteur for the bill. Since then, the deputy has sought to reconcile the main proposals presented to the house, seeking agreements with both "sides" of the debate. Over the years of discussion, Lafayette has opened dialogues for maintaining the current EECS rules for old users while decreasing the compensation ratio for new users.

Marcelo Ramos, Federal Deputy of the State of Amazonas, on the other hand, during the proceeding of Bill of Law 5829/2019 affiliated with the Liberal Party (PL), was against maintaining the compensation rules established by NR Nº 482 during all the years of discussion on the issue. Due to his strong performance in the discussions, he became the main representative against incentives for distributed generation in the Legislative Branch.

The deputy claims that there is no legal provision for the EECS established by NR Nº. 482 and that this system is configured as a "subsidy" to these self-generators, equally without legal support for it to occur. These arguments are based on the conclusions presented by the TCU.

According to the deputy's understanding, the then "subsidy" established by Aneel is harmful to electrical consumers who do not have distributed generation because it makes these consumers pay for the tariffs of DG users. In his several pronouncements, Marcelo Ramos also exposes his opinion about "taxing" the sun, an expression that characterized the debate about NR Nº. 482:

> [...] I want to first restore truth and rationality to this debate. Actually, nobody is discussing taxing the sun; what we are discussing is to stop taxing the poor to pay for the rich's energy. The subsidy that exists today in DG is a real Robin Hood policy in reverse [...], for those who cannot afford to hire DG and put solar panels to pay part of the bill of those who can, which are the people with higher purchasing power [...]. (RAMOS, 2021).

During the proceedings in the Chamber of Deputies, until the regulatory framework was established, Marcelo Ramos presented himself as a defender of the end of the EECS and the "poor" non-DG users:

> The big problem is who can afford a solar power panel for their own generation. The poor cannot. And when the middle class and upper-class switch to solar power and stop paying the wire bill, that bill goes to someone else. Goes to whom? For the captive consumer, which is the poor who cannot afford a solar power board (RAMOS, 2021).

On the other hand, Congressmen Beto Pereira and Rodrigo Agostinho were supporters of the EECS established by NR Nº. 482, and for this, they presented specific Bill of Laws and amendments to Bill of Law 5829. In addition to publicly positioning themselves in discussion and decision-making spaces in the Chamber of Deputies. For Congressman Beto Pereira:

> [...] Aneel, in 2019, had the pretension in a single, exclusive, unilateral measure to devastate the whole sector. That measure, which this house rebelled against, would make any investment in renewable energy unfeasible in this country (PEREIRA, 2021).

The Congressman also questioned the presence of the Minister of Mines and Energy during the plenary sessions held on the subject and in the hearings of the Consumer Defense Commission – where the issue was also discussed. Beto Pereira highlighted the importance of a representative of the Federal Government in the debates since the Chambers of Deputies and society need to know the government's position on the Brazilian energy policy and the country's plans for renewable energy.

Given his constant involvement with the theme, the Congressman presented to the Chamber of Deputies the Bill of Law 2215/2020, which aimed to change "Law Nº. 9074, of July 7th, 1995, to establish the Electrical Energy Compensation System (EECS)" (BRASIL, 2020). The Bill of Law was attached to Bill of Law 5829/2019 and started to be discussed by the rapporteur Lafayette de Andrada.

In the same way, Congressman Rodrigo Agostinho actively participated in constructing the Bill of Law 5829/2019. For Agostinho, the theme is of national interest, and developing this public policy is fundamental for improving clean energy in Brazil. Still, according to him, it will be essential that the defenders of the sector unite because "people will not want to give up the thermoelectric plants, the rotten coal industry. We are going to have to confront and have our agenda with a lot of unity and move this forward" (AGOSTINHO, 2020).

The Congressman proposed eight amendments to the project's text in this sense. The rapporteur rejected five of these eight because they were already contemplated in the adjusted project proposal. Highlight to amendment 21 that proposes the reduction of the payment price for the Distribution System Use Tariff (DSUT) Wire B, considering a term staggering on the amount paid (RUBIM, 2021).

In addition to these contributions, Bill of Law 5829 received another 59 amendment proposals among opponents and supporters of the EECS. At the end of two years of discussions, textual adjustments, and amendments by the Federal Senate, Bill of Law 5829 had its final wording on 12/17/2021. The final wording became Law Nº. 14300/2022 on 01/07/2022.

Law Nº. 14300 maintained the rules established by NR Nº. 482/2012 on the EECS for all consumers already connected to the grid and for new projects until January 2023. For these consumers, the

current rules will be maintained until 2045. New consumers connected to the grid, as of 2023, will have the energy generated partially compensated. These new projects will now pay part of the Wire B (the tariff that pays the distributors) or part of the Wire A (the tariff that pays the transmitters). What is new about these fees is that they will be staggered over the course of each year.

Despite the unanimous vote on the final wording of Bill of Law 5829, Congressmen Marcelo Ramos and Lafayette de Andrada understood that the EECS is "fairer" than what was foreseen in NR Nº. 482, although they believe that the incentives to the system should have been reduced or even excluded.

Similarly, EECS advocates understand that the Law is more flexible and advantageous for advancing solar energy than the proposed revision presented by Aneel. Although it was also not the most compatible with Brazil's current energy situation and with the commitments made by the 2030 Agenda and the Paris Agreement.

3.1.10 PRESIDENCY OF THE REPUBLIC

In view of the debates about the revision of the normative, Bolsonaro has manifested himself against the proposal for revision of NR nº. 482 presented by Aneel. According to the President, his government is against taxing the solar source, although he is aware of Aneel's autonomy to regulate the subject.

Given the regulations revision developments, Bolsonaro met with the President of the Chambers of Deputies at the time, Rodrigo Maia, and with the President of the Senate, Davi Alcolumbre, to discuss the issue. The agreement between the parties was to prevent the approval of Bills that would establish the taxation of solar energy and the withdrawal of the current EECS rules.

After almost three years of discussions, and with the request for urgency for the negotiations on the subject in Congress, the Bill 5829/19 was sanctioned by Bolsonaro, originating Law 14300/2022.

3.2 IDENTIFICATION AND COMPOSITION OF THE EXISTING GROUPS

The analyzed actors are organized into two groups: Group 1 – in favour of the rules established in NR No. 482/Aneel, and Group 2 – against the rules established in NR Nº. 482/Aneel.

Group 1 comprises Absolar, MP, President of the Republic, Congressmen Beto Pereira and Rodrigo Agostinho, OC, Inel, Revolusolar, and MSL (Table 1).

Table 1 | Composition, Representation, and Main Arguments of Group 1

GROUP 1 *In favour of the Rules established in NR no. 482/Aneel*				
Actor	*Society Sector*	*Representation*	*Main Arguments*	*Main interests*
Absolar	3rd Sector	Solar sector (companies, manufacturers, academia, freelance professionals, institutions)	The maintenance of the rules stimulates Brazil's solar irradiation potential, the reduction of electric losses, and social advances	Expansion of the solar source in the electric sector
MP	1st Sector	Society	The rules established in the resolution present environmentally friendly market solutions	Defence and protection of the environment and the consumer's vested right

GROUP 1 *In favour of the Rules established in NR no. 482/Aneel*				
Actor	*Society Sector*	*Representation*	*Main Arguments*	*Main interests*
Jair Bolsonaro	1st Sector	Country	The solar source needs to be stimulated by the government	Record expansion of the solar source during the years of his government. Intending to have the solar source as the pre-salt of his government.
Beto Pereira	1st Sector	State of Mato Grosso	Investments in renewable energy are the best way forward and bring greater balance to environmental issues	Maintenance of rules for greater legal certainty in solar investments. Environmental advocacy in favour of the commitments outlined in the Agenda 2030 and the Paris Agreement.
Rodrigo Agostinho	1st Sector	State of São Paulo	The maintenance of the rules expands and favours investments in solar energy, which decreases the dependence on fossil fuels	Maintenance of rules for greater legal certainty in solar investments. Environmental advocacy in favour of the commitments outlined in the Agenda 2030 and the Paris Agreement.
OC	3rd Sector	Coalition of Brazilian Civil Society Organizations	The maintenance of the rules stimulates the Brazilian capacity for clean energy generation and benefits the country's economy	Environmental advocacy in favour of the commitments outlined in the Agenda 2030 and the Paris Agreement. Acting on the topic of climate change.
Inel	3rd Sector	Transport sector, households, agriculture, industries and commerce	The contribution of solar energy should be stimulated to be larger than the fossil and nuclear contributions	Environmental advocacy in favour of the commitments outlined in the Agenda 2030 and the Paris Agreement. Acting on the topic of climate change.
Revolusolar	3rd Sector	Low-income communities in Rio de Janeiro	The change in the rules jeopardizes the legal certainty and regulatory predictability of the DG segment	Maintenance of rules for greater legal certainty in solar investments.
MSL	3rd Sector	Energy consumers, entrepreneurs, workers, academia	Changing the established rules is not consistent with the policy of universal access to energy in the country	Expansion of the solar source in the electric sector

Source: Own authorship, 2022.

For this group, the solar source has the potential to promote social development, considering the creation of jobs, private capital investment, and the savings generated for the government spending. Also, it can promote an energy transition towards a cleaner and more sustainable electricity matrix, reducing greenhouse gas (GHG) emissions and contributing to the achievement of international commitments and goals. In addition, Group 1 believes that the incentive to this source generates

economic, social, and environmental benefits, besides reducing the pressures on the distribution and transmission grids and encouraging local energy consumption.

In turn, Group 2 is composed of Aneel, TCU, Congressmen Marcelo Ramos and Lafayette de Andrada (Table 2).

Table 2 | Composition, Representation, and Main Arguments of Group 2

GROUP 2 *Against the Rules established in NR no. 482/Aneel*				
Actor	*Society Sector*	*Representation*	*Main Arguments*	*Main interests*
Aneel	1st Sector	Society	The change in rules is necessary to ensure that the system continues to grow sustainably without impacting other consumers	Decrease the incentive to use DG in favour of economic benefits for the energy utilities (lobby)
TCU	1st Sector	Society	"The rules for using DG need to be built on solid foundations that do not reduce efficiency at the expense of other bases in the electricity sector, especially low-income consumers" (NETO, 2021)	Decrease the incentive to use DG in favour of economic benefits for the energy utilities (lobby)
Marcelo Ramos	1st Sector	Amazonas State	The rules established in NR No. 482 have no legal prevision and configure a "cross-subsidy", in which the "poorest" pay for the costs of the "rich	Decrease the incentive to use DG in favour of economic benefits for the energy utilities (lobby)

Source: Own authorship, 2022.

This group believes that the EECS established in NR Nº. 482 generates losses for non-DG users since it transfers costs not paid by the DG users to the "poorest" part of the population. According to this Group, this reduction in the tariff for DG users impacts the maintenance costs of the transmission networks since the tariff also remunerates these costs. That way, Group 2 is against the EECS established in NR Nº. 482.

4 DISCUSSION

Although the EECS allows the reduction and even cancellation of electricity tariffs, the generating consumers continue to pay for the availability fee, charges, and public lighting. Based on this relationship, Group 1 is in favour of maintaining the EECS, mainly because of its importance for photovoltaic energy generation in the country and for making possible even greater contributions to the Brazilian electricity matrix.

In addition to environmental benefits generated by the increased use of the solar source, Group 1 also relates the regulation and the EECS to the "more than 233,000 jobs and more than 39.8 billion in new investments" (BAITELO, 2021) in Brazil since the publication of the regulation. Also, the movement of this market can generate additional income for the population and promote a fairer and more inclusive economy (KALOGIROU, 2004; MARTINS, 2017; VIEIRA, 2016).

This Group recognizes the importance of the EECS and a regulatory framework for the sector. Moreover, this instrument's absence is considered to be the main barrier to advancing the solar source in Brazil. Therefore, countries such as Germany, Italy, Japan, Spain, and the United States, for example, have invested in public policies and incentive programs to expand the use of photovoltaic systems, with a primary focus on electrical decentralization (MACHADO; MIRANDA, 2015).

Germany, for example, implemented its most high-profile policy in 1998 to install 1,000 photovoltaic systems in the country (PUIG; JOFRA, 2007). In California, the government makes it mandatory to use photovoltaic systems in new constructions (RHODES, 2020; WEDY, 2021). The literature shows that leading countries in installed solar capacity have been investing in plans for solar source expansion for at least 20 years (PUIG; JOFRA, 2007; SHARMA; TIWARI; SOOD, 2012; WEDY, 2021).

Furthermore, other actors in this Group also report the benefits of the solar source for the stability of the Brazilian electricity system. One example is to take advantage of the source for more massive electrical support and rely on the hydroelectric plants for supply during the "absences" of the solar source and other renewables (SILVA, 2021). Since "these sources, however intermittent, contribute to the security, stability, and reliability of the Brazilian electricity system" (SILVA, 2021).

On the other hand, Aneel and the TCU (Group 2) did not consider the arguments presented above at the time of the analyses to revise the regulation. The two bodies claimed that they are responsible for regulating the sector and auditing the Federal Administration's accounts and that socioeconomic and environmental benefits should be an exclusive matter for the National Congress. Even though these agencies have society as the final beneficiary, the advancement of the solar source, mainly through DG, brings benefits to the National Interconnected System (Sistema Interligado Nacional – SIN) – also regulated and inspected by Aneel.

According to the results of the studies presented by the TCU, the EECS provides a subsidy to the DG user because, theoretically, this user does not pay for the excess energy produced injected back into the grid. Besides having the monthly electrical tariff practically zeroed, which in theory, stops remunerating the electric power utilities. With this, the TCU presented concerns about the expenses until 2035 with the continuity of this subsidy.

However, the estimate of these expenses is not expected to come from the public coffers but rather from the energy utilities, which theoretically would no longer receive this revenue. In addition, the Court's opinion on the regulation seems to be concerned with the regulation of private market issues, which should not be the Court's study object.

Corroborating this study, Deputy Marcelo Ramos understands that the absence of remuneration for the utilities generates more expenses for maintaining the distribution networks. In this case, these costs are transferred to the tariffs of traditional consumers who are not DG users. Eid's (2014) study also supports this argument, which presents the possible consequences of deploying net-metering systems[1] from solar energy. Despite recognizing its importance in reducing GHG emissions and mitigating the effects of climate change.

However, Brown (2017) points out that even though the costs of net metering are passed on to the utilities, this "loss" is offset by the benefits that solar energy brings to them, such as the reductions in spending on generation, transmission, distribution, and management of their own networks. In addition to reducing negative externalities to the environment and consequently to society and replacing centralized power generation systems (BROWN, 2017).

Based on these arguments, Group 2 believes that the EECS is a cross-subsidy mechanism in which non-DG users pay for the tariffs of DG users. Based on this, Marcelo Ramos classifies NR Nº. 482 as a "Robin Hood policy in reverse", where the "poor" pay part of the bill for the "rich".

Group 1 sees just the opposite of this relationship: DG's benefits would not only be for the generators and users themselves but for society, especially for the Brazilian electrical system. With the decrease of captive consumers in conventional networks, there is also a decrease in the need for maintenance and new investments in transmission and distribution networks, transforming electrical consumption into something more local and decentralized, in addition to the injection of surplus energy directly to the grid (BROWN, 2017).

In addition, using the solar source enables new planning and "optimization of new investments in generation, transmission and distribution of energy" (MARTINS, 2017, p. 12).

Therefore, for Group 1, the growing installation of photovoltaic systems is increasingly interesting for the energy (and environmental) security of Brazil and the autonomy of its consumers, generating positive effects for the grid and mainly for society (BROWN, 2017). On the other hand, Group 2 sees this increase in installations as a "vicious circle" for the utilities' profits.

From this discussion, the idea of "taxing" the surplus production that is not consumed and injected into the network was born. Group 1 saw this possibility as an obstacle and a disincentive to the DG user, claiming that the proposal did not match the reality and irradiation potential of the country. Besides being a step backwards for environmental issues, especially in the context of climate change, which makes electrical systems even more vulnerable. The position of these actors is that the government should further encourage the uptake of solar energy by presenting incentives and new proposals to make its supply system more reliable and stable. Besides considering the importance of the solar source for the energy demand in the country and the world matrix (KABIR, 2018).

They even present comparative studies of subsidies applied to society by the government to increase the use of solar power, as in California. There, "the government subsidizes about 80% of the costs, provides legal certainty for 20 years for the EECS, and presents other even more impressive legislation" (PINTO, 2021).

In countries like Germany, for example, the government considers distributed generation from renewable sources more expensive than that provided by the grid. Moreover, it remunerates the producer for the surplus generated through the premium tariff system – feed-in-tariff (FIT) (MACHADO; MIRANDA, 2015). The same instrument is used in Australia, although with an added incentive, since the Australian premium tariff considers the total gross generation for producer remuneration for 20 years from the date of implementation of the policy (LAMARCA JÚNIOR, 2012).

In the United States, though, the government proposes an individual or corporate income tax reduction of up to 30% for users of distributed generation with photovoltaic systems – Instrument Investment Tax Credit (ITC) (CALAZANS, 2016; WEDY, 2021), in addition to the Modified Accelerated Cost Recovery System (MACRS) which provides for the recovery of investments in photovoltaic systems through annual deductions (CALAZANS, 2016; WEDY, 2021).

Other incentives are applied to other countries to encourage solar energy, such as investment tax credits; public financing and investment programs; and direct capital subsidies (TIMILSINA; KURDGELASHVILI; NARBEL, 2011; LAMARCA JUNIOR, 2012). In addition, there is the net metering system in which excess production from the system is sold to power companies to be made available to other consumers (JEAN *et al.*, 2021; LAMARCA JÚNIOR, 2012; TIMILSINA; KURDGELASHVILI; NARBEL, 2011). Furthermore, renewable energy portfolio standards set targets for the share of renewable sources for energy suppliers (LAMARCA JÚNIOR, 2012; TIMILSINA; KURDGELASHVILI; NARBEL, 2011).

The literature shows that the rules established in Aneel NR Nº. 482 conform, even if only in a preliminary way, with the main policies adopted around the world in relation to the promotion of solar energy and

DG. Several countries adopt combinations of these instruments to enhance their results in terms of installed capacity.

Considering all these aspects, Bill of Law 5829, 2019, was presented to establish legal certainty for the sector and present fewer rigid proposals for the EECS than Aneel. The public debate, with its various slogans and arguments, lasted two years and created a tax on the surplus electricity generated.

Given the approval of the regulatory framework, Group 1 was satisfied with the final draft proposal, which contains fairer and more feasible rules for the sector. Although costs for DG consumers have increased, new consumers do not find the EECS the most advantageous way.

Group 2, on the other hand, had reservations about maintaining the EECS and was dissatisfied with the final wording of the Bill. These actors understood that the Bill still leaves the utilities at a disadvantage and classified it as not ideal but fairer than NR Nº. 482.

On the other hand, the framework is not in dialogue with the country's sustainability agenda – mainly with the 2030 Agenda and the Paris Agreement –and was not designed in an integrated manner with other sectors of society that also influence the sector.

The 2030 Agenda for sustainable development is composed of 17 Sustainable Development Goals (SDGs) and 169 integrated targets, which consider the different realities and development and policy capacities of the agreeing countries (MCCOLLUM, 2018; PEIXER, 2019; VASCONCELOS; DE MORAES MELLO, 2021). The emergence of the Agenda is precisely to achieve a world with a safe and secure environment and universal access to energy sustainably and reliably (UN, 2015).

Against this background, the discussion of the regulatory framework could have also contemplated the new challenges of national and international cooperation in the search for innovative and integrated solutions (MCCOLLUM, 2018; PEIXER, 2019; UN, 2015). Since the 2030 Agenda presupposes a global engagement that includes local and federal governments, civil society, universities and education and research centres, the private sector, and all the actors necessary for the implementation of these integrated, complex, and innovative goals (PEIXER, 2019; UN, 2015).

The centrality of SDG 7 to the Agenda makes it clear how much this theme demands joint and broad efforts from all sectors of society. Access to energy correlates with the creation of new jobs, the opening of new technological markets, and innovation possibilities (AKTER *et al.*, 2017; BERNARD; TORERO, 2015; BURNEY *et al.*, 2017; CHAKRAVORTY *et al.*, 2014; GROGAN; SADANAND, 2013; MCCOLLUM, 2018; PUEYO *et al.*, 2013; RAO; 2013; VAN VUUREN *et al.*, 2015), and "fostering a Country's economic growth" (SCHWERHOFF, 2017, p. 3).

Similarly, energy access and use of renewable sources is also a central theme for reducing global GHG emissions (ANENBERG *et al.*, 2013; CHERIAN, 2015; GAMBHIR *et al.*, 2017; KRIEGLER *et al.*, 2013; KRIEGLER *et al.*, 2014; MCCOLLUM, 2018; RIAHI *et al.*, 2015; RIAHI *et al.*, 2017; ROGELJ *et al.*, 2013; VAN VUUREN *et al.*, 2015). This contribution is directly linked to the Contributions outlined by Brazil in the Paris agreement.

The Paris agreement, ratified and in force since November 2016, is considered the world's largest pro-climate agreement (FALKNER, 2016; LACLIMA; OBSERVATÓRIO DO CLIMA, 2021; SOUZA; CORAZZA, 2017). It aims to stabilize global temperature below 2°C while maintaining efforts to limit it to 1.5°C (FALKNER, 2016; LA CLIMA; OBSERVATÓRIO DO CLIMA, 2021; PEIXER, 2019; SECAF, 2016; SOUZA; CORAZZA, 2017). To this end, countries have committed to present long-term strategies for reducing GHG emissions, called Nationally Determined Contributions (NDCs) (FALKNER, 2016; REI; GONÇALVES; DE SOUZA, 2017; SOUZA; CORAZZA, 2017). The Brazilian NDC commits to reducing GHG emissions

by 37% by 2025 and by 43% by the year 2030, considering the entire Brazilian territory and economy (BRASIL, 2015; PEIXER, 2019; REI; GONÇALVES; DE SOUZA, 2017).

Considering that the energy sector is the largest emitter of GHG in Brazil (responsible for 33% of emissions) (MENDES, 2020) and that the commitments made will require even greater efforts in the sector, in public policies and in the planning done by the government, the discussion about Law Nº. 14300/2022 could have been used to plan these actions. They are mainly linked to the expansion possibility of the solar source and incentives to the use of new renewable sources so that these have more and more competitiveness and market dominance. The largest electric participation today is related to the hydroelectric source, which makes the energy matrix clean, but centralized and not very diverse.

5 CONCLUSIONS

Despite the socioeconomic and environmental benefits, distributed solar power generation still faces resistance to reaching its full potential in Brazil. This happens despite the commitments established by the 2030 Agenda and by the NDCs, which point out decarbonization strategies for the world's electricity matrix through guidelines defined by each country. Based on these agreements, Brazil has made commitments to reduce GHG emissions. However, it has not established any action plan for this goal, whether considering the expansion of new renewable sources or new generation forms, such as decentralized generation.

On the other hand, starting with the establishment of Aneel Resolution Nº. 482/2012, distributed generation skyrocketed in Brazil and was responsible for the increase in installed capacity at record levels of the solar source in the country. Nevertheless, the debates about the revision of NR Nº. 482 have not considered the strategic nature of the theme, the opportunity costs and the savings to the public coffers due to the adoption of new sources in the electric matrix. They also disregarded international commitments, the climate and the sustainable development agenda. The active groups have been reduced in monetary discussions. With this, the disputes over the legal framework for the regulation of the sector have resulted in a setback to the incentives for its expansion.

The debates until then did not consider the strategic nature of the energy issue for social development, as well as for the 2030 Agenda established worldwide. In addition, they did not consider the real need for government investments and integrated planning to expand non-GHG-emitting sources, such as solar power.

Given this context, Brazil does not propose any integrated action plan between the different governmental or transition agendas for low-carbon economies and the transformation of sustainable cities in the 2030-2050 horizon. Therefore, the centrality of the energy issue in achieving the commitments of the 2030 Agenda and the Paris Agreement is disregarded.

NOTE

1 | Policy that allows the compensation of part or all of self-generated electricity. The system has a meter that can identify when a self-generating consumer consumes more or less energy than it produces. When there is less consumption compared to production, producers receive benefits that function as energy credits (POULLIKKAS; KOURTIS; HADJIPASCHALIS, 2013).

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