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Chapter

Voluntary Certification of Carbon Emission in Brazil - The Experience of an Electricity Trader

Fernando Amaral de Almeida Prado and Edvaldo Avila

Abstract

Few countries in the world have such availability of natural resources as Brazil. Even so, the country records increasing greenhouse gas (GHG) emissions related to electricity, and this is due to political and economic factors. This chapter shows the experience of the largest Brazilian power trader in its pioneering effort to develop voluntary certifications (2011) in power buy and sell transactions, along with other energy efficiency actions. The initiative has accumulated 9 years' experience with more than 1600 units in different industries, using a methodology aligned with the Paris Agreement. The chapter presents the calculation methodology and the safeguards that ensure information integrity and verification of the certified indicators. Only renewable sources are used in this methodology, such sources being qualified as incentivized by their sustainability characteristics being small-size power plants (less than 30 MW of capacity installed).

Keywords: greenhouse gases, voluntary certification, power trading, Paris Agreement Brazil

1. Introduction

The creation of a project for voluntary certification associated with the consumption of electrical energy developed jointly by Sinerconsult Consultants and Comerc Energia, the largest power trading company in Brazil (Comerc manages a portfolio around 26,000 GWh/year), was motivated by the perception of the worsening emission conditions related to the Brazilian energy sector. Both organizations were among the first to realize in Brazil that Kyoto Protocol Policies would lose force, and therefore, the natural alternative would be to adopt voluntary measures, as the Paris Agreement would later prove during Conference of Parts (COP 21).

Few countries in the world have such a strong renewable energy generation matrix as Brazil. **Figure 1** shows that 73% of the installed capacity in Brazil comes from renewable sources [1]. In the past 5 years, however, power generation from thermal plants has been on the rise, despite the growing proportion of renewable energies. **Figure 2** indicates this growth [2].

This can be traced back to a conceptual issue regarding environmental protection. Since the mid-1990s, all new hydroelectrical power plants have been conceived as run-of-river.

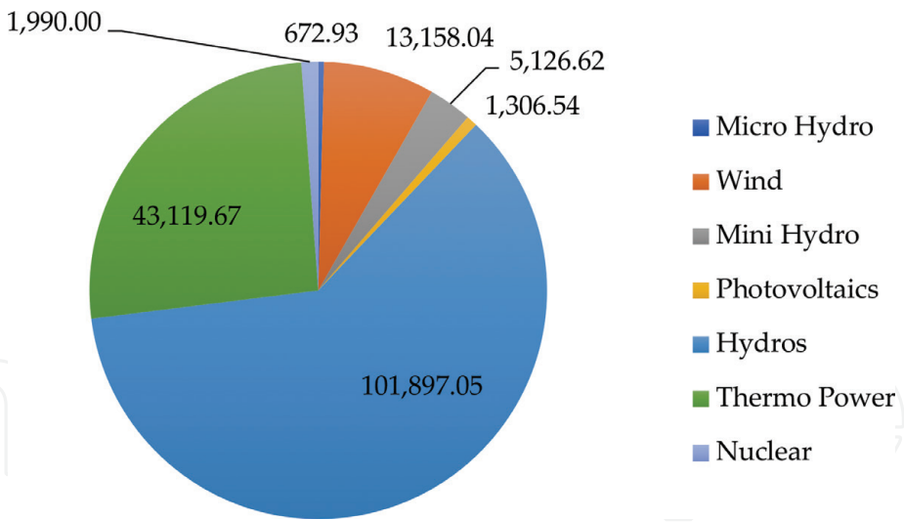


Figure 1.
Capacity power in Brazil in MW (July 2018) [1].

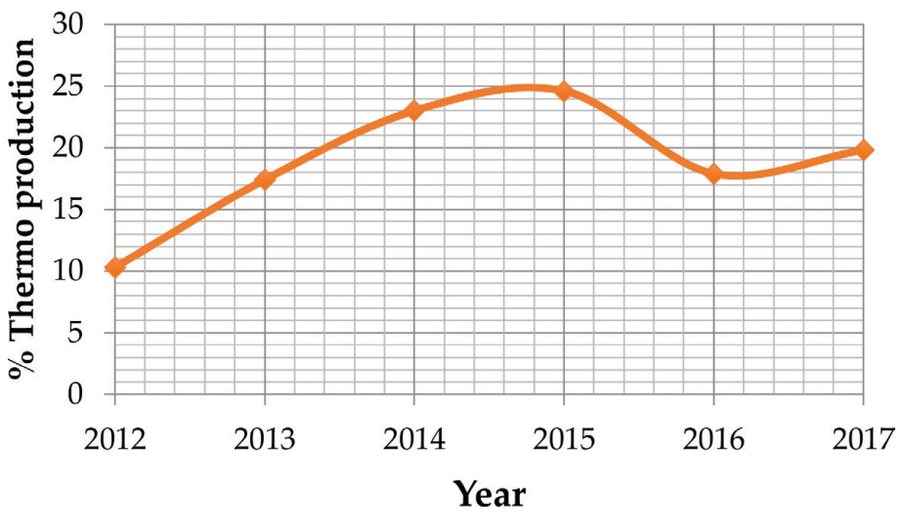


Figure 2.
Production percentage from thermal power plants [2].

Therefore, the operational capacity of the Brazilian hydroelectrical power plants, once fed by large rivers, no longer had pluriannual reservoirs. More and more, whenever hydrological conditions are adverse, the interconnected system needs to rely on thermal plants. Another point is that the growing insertion of wind farms, characterized by high intermittence, also leads to more frequent deployment of thermal plants. As a result, greenhouse gas emissions (GHG) have grown significantly, albeit still relatively low compared to countries with high thermal generation profiles. Alarmingly for Brazil, though, the emission levels measured in 2014 are already higher than government projections for 2030 [3]. **Figure 3** shows the growth trend for emissions [4].

Paradoxically, one of the countries with the broadest natural resources has shown deteriorating performance in emission indicators correlated with climate change.

As mentioned above, the perception of the increasing importance of voluntary actions and growing emissions attributable to the electrical energy industry have been the two key driving forces that led to the actions that will be detailed in the following sections. Nevertheless, from a wider perspective, the key issue is climate change, a serious concern for most countries.

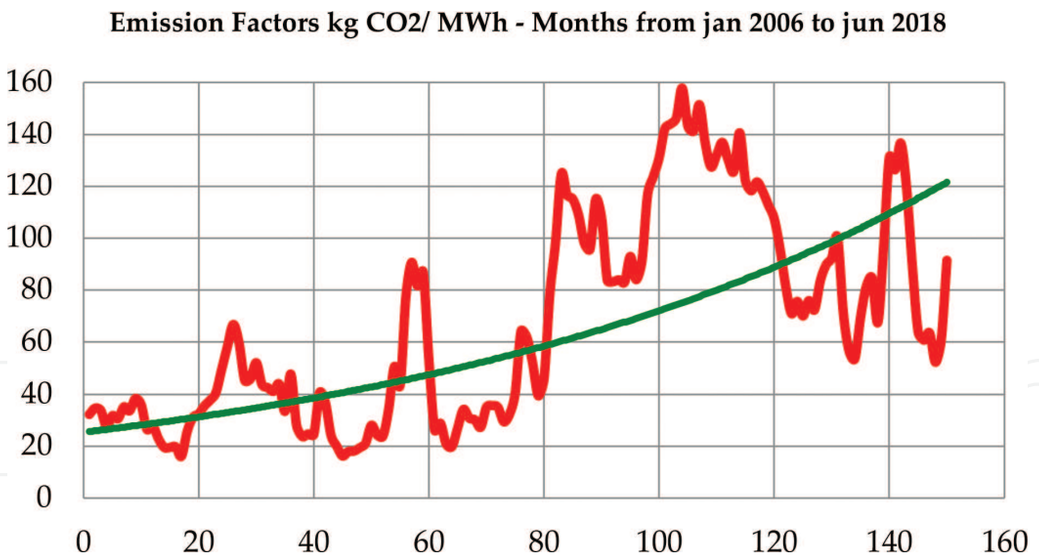


Figure 3.
Emission factors for the interconnected Brazilian system [4].

Section 2 presents the analysis of voluntary markets and the need for clearly defined certification. Section 3 reviews the general context of the Paris Agreement and its pending issues regarding emission certification. Section 4 analyzes the general problem of calculating the greenhouse gas emissions in interconnected systems. Section 5 presents the factors that led Sinerconsult and Comerc to develop the certificates in the proposed form and the concepts utilized. Section 6 describes the calculation methodology. Section 7 reports the results achieved during the 9 years since the implementation of the certificate. Section 8 describes the evolution from certificate to energy efficiency actions, and Section 9 presents the final tentative ideas for the future and perspectives for voluntary certification in Brazil.

Several ideas related to this chapter was developed initially in an article "Clean Energy Certification in Brazil: A proposal," published in the Journal of Sustainable Development of Energy, Water and Environmental Systems, by two of the authors[1] of this chapter [5].

2. Voluntary markets: Do they work?

Over the years, many companies have received incentives or mandatory rules in order to develop initiatives to reduce their GHG emissions.

A voluntary market is one that comes from a no mandatory initiative, decided by a country or by a corporation in order to make a sensitive contribution to one "cause."

In this chapter, the focus is centered on an initiative that contributes to reduce GHG emissions and to help in the fight against climate change made by volunteered initiative of one of the biggest energy trader in Brazil.

Even the USA, a country that has not to date adhered to formal agreements and remains adamant in resisting international cooperation, has hundreds of voluntary initiatives of their own to reduce emissions. Here, we list some of the strategies that have been used: (i) regional legislation, (ii) sectorial policies, (iii) initiatives by industry associations, unions, and nongovernmental organization (NGOs), and (iv) business initiatives. Each one of the initiatives has its own motivation, and they may or may not be limited to their corresponding industry.

[1]The other two authors of original paper allowed the present authors to use the primary information.

Take for example, the carbon disclosure project (CDP) [6], which in 2017 involved more than 6300 of the largest companies around the world to reveal progress in avoided emissions. Around 89% of them now have their own emission reduction target. Such initiatives can foster best practices around the world by helping people and companies think strategically about climate change. More than this, most of the companies also included their suppliers in their reduction targets. If met, the targets could be relevant contributions to the required GHG abatement to cap global warming at no more than +2°C. The CDP report disclosed reductions equivalent to 551 million tons of CO_2 in 2017, with associated cost savings of US$ 14 billion [6].

A review of the literature on voluntary markets [7–16] indicates that when information is available, the behavior of customers could be affected, also the demand for environmental friendly products. Companies with voluntary initiatives can benefit from them by gaining a positive image with final consumers.

Delmas and others [10] found that once energy is required to produce goods and services, consumers can drive change by choosing goods and services associated with renewable or "green" energy [10]; a good example of its importance is that renewable energy market in United States of America (USA) in the last 10 years (2007–2017) has grown up 5.4% yearly [16].

Delmas and others [9] found that a deregulated industry where competition is still incipient will be more affected by consumer perception and sensitivity to the issue, favoring the insertion of renewable sources, as can be better explained in following sections. The same perception can be reported by the authors of this chapter, in their experience in Brazil. Some of the clients of Comerc are very proud about their certificates. However, Delmas and others [9] note that sources of low cost such as coal can affect the decision process with the low price being the winner.

Kotchen, on the other hand [11], put on doubt if simple low-cost public policies can effectively promote stable voluntary initiatives, and whether such initiatives will continue to be effective, especially if more centralized policies are required in future.

Are voluntary and mandatory initiatives complementary or substitutes? In the opinion of authors, and likely in the opinion of anyone who reads the 2018 CDP Report [6], all parties, government and customers, must be involved in the effort. The figures cited by Hamilton [14] (volunteer markets could be US$ 100 million/year) probably will be much more impressive with a successful Paris Agreement.

The initiatives give companies the tools they need to be prepared to lead the way in GHG regulation. "This market is growing fast, perhaps doubling each year." Hamilton's recommendation, however [14], centered in the needs of tools to measure the emissions targeted, an opinion that the authors share. This need comes from a pattern that will be required for compliance of the goals self-established.

There is no unanimity about the efficiency of volunteer markets; Ferguson, by instance [15], believes in many barriers, high costs, and complexity in reporting trustable results. Higher costs in voluntary markets result from the nonexistence of deterministic goals, as obvious. The agent can always decide not to invest in reducing its emissions, while others in doing so make its operation more costly. In regulated industry, usually the regulator does not recognized costs that are not strictly related with regulation, so even an action that could be defensible may impact in economic results of a goodwill initiative.

Reporting results is always complex. There are several alternatives in the way to report the figures, per unit of production or through corporations and their subsidiaries, especially in different countries with different legislations. Some emissions come directly from the company and the others from the suppliers in chain production. Due to avoiding double accounting, this kind of information must be carefully reported and checked.

More than this, there are the difficulties related to the "leaks" that can occur along the chain production. Just to focus on the electricity industry, one can use the example of a wind power plant (carbon-free by definition) but that needs a high voltage line of interconnection, which demands some deforestation.

Kim and Lyon [12] share the pessimist view because only projects with low marginal costs are likely to succeed, as the regulatory risk is too high. Regulatory risks should be especially considered because if there are no rules, a subsequent emergence of these rules can make impossible to account for past initiatives. The hypothesis of the emergence of rules is not contradictory even in voluntary markets, since a country can voluntarily create its goals in international diplomacy, and to accomplish them, needs to encourage their fulfillment by incentive or even by mandatory regulation in some segments of the economy. A cap and trade environment could help the management of this kind of uncertainty.

Other beliefs from Hofmann [8] are connected with the junction of a public policy with some associated benefit, such as Brazilian incentives in transmission tariffs for small renewable generators, and volunteer markets. The authors would add to this, the goodwill or favorable image associated with environmental marketing.

3. Paris Agreement: understanding the main issues

Two decades after the creation of the United Nations Framework Climate Change Convention (UNFCCC), the parties (countries) remain firm in their decision to contribute to the reduction of GHGs, but the debate continues about how to share the burden among the parties, especially because of the substantively different development levels. The problem of coordinating actions has also been considered very important.

The previous experience with the Kyoto Protocol, where responsibility was distributed differently between developed and undeveloped countries, did not work. Countries such as the United States and Canada did not ratify the protocol in the belief that the effort and cost faced by developed countries would be wasted by developing countries, which had no deterministic emission reduction targets at the time [17].

The established targets and metrics were also questioned, so after the Kyoto Protocol expired, no new agreements with similar methodologies could be established. An interesting example of such divergences may be the case of China: the country's emission indicators are higher than those in the USA, yet are substantially smaller if considered on a per capita basis. A parallel reasoning can be applied to the analysis if we consider the useful life of emissions in the atmosphere: in a cumulative calculation, Chinese emissions remain far below those produced over decades by developed countries.

This deadlock was bypassed in the Paris Agreement, which declares the sovereignty of each country in choosing and setting possible goals within a process of goodwill. Article 6 of the Paris Agreement states that countries may cooperate internationally in different ways in order to reach climate goals and defines broad enough conditions, so that the targets set voluntarily by the parties, known as Nationally Determined Contributions (NDC), can be achieved.

The UNFCCC targets established that the average world temperature not exceed 2°C at least with a probability of 50%, so the goals for different countries, even defined in voluntary way, need to take in count a common objective.

There is a mood of relative optimism, or at least, it seems to be overcoming the pessimism that followed the expiration of the Kyoto Protocol; however, there are still many adjustments to be made.

Among the most relevant points that could be mentioned is the need to create metrics to compare the efforts expended by countries, since different ethical concepts can be raised, involving, for example, the "polluter pays" principles [18] (especially defended by Brazilian Diplomacy).

Other aspects include the principle of equity, in other words, the right each party has to guarantee its citizens can have access to the planet's natural resources; the principle of capability, the capacity to produce actions that are feasible for the country, and finally, the principle of sovereignty, that involves the discussion of whether countries should have proportional targets or whether the sovereign right to decide according to their circumstances would apply. It should be noted that with regards to the "polluter pays" principle, it would be necessary for the carbon "price" to be evenly defined to avoid "polluter havens" [16].

Most of the points above are included in the COP 24 agenda—the summit will take place in Poland in 2018 to discuss accounting principles, legislation, procedures, compliance with the targets defined by the NDCs themselves, as well as the rules to report reductions achieved through market mechanisms, including voluntary certifications.

4. Grid emissions: understanding the problem

Brazil has one of the largest interconnected systems in the world with similar dimensions to Western Europe (**Figure 4**); for large systems like this, it is very hard to quantify the amount of GHG emitted, especially with a combination of so many different sources with different environmental attributes like a coal-burning thermal plant or a carbon neutral small-scale wind turbine, for instance.



Figure 4.
Brazilian interconnected grid [4].

Being the Brazilian commercial model, a system of free competition, theoretically each plant at any point of the grid could inject the energy destined for a certain final consumer. It happens that even though the system is interconnected, the laws of physics determine that power and electric flows occur depending on the network topology, voltage levels, and the relative positioning between generation and load. Also, as interconnected grids are operated usually by independent entities and the criteria for dispatch is in regular bases, efficiency and supply security, it is virtually impossible to unequivocally associate load and generation.

This could be more complicated in Brazil, as sometimes hydro plants (the main source of power production in Brazil) may even be switched off to preserve water in the drier months, for future use. The resulting energy deficit is offset by energy produced by thermal plants burning a range of fossil fuels.

Therefore, there would be no one to one correspondence between generation and consumption, so the emission factor likely to be accounted for could be only that resulting from the average value to be determinate from some reasonable criterion.

However, there is a very important conditioner that brings a solution to this issue, the purchase and sale contracts. Thus, considering that, the energy produced cannot be stored (at least not in relevant quantities and at competitive costs) and assuming that the electricity consumed is equal to that produced (after technical and commercial losses), the match between generation and load is supported by the contracts. Therefore, the generating fact that connects a consumer to a low-emission production (for example, small hydro power plant) can be made through the contract between the parties.

The methodology used by Comerc-Sinerconsult uses the set of rules established by the United Nations (UN) named "ACM-002-Methodology for Calculating the Average Grid Emission used for Clean Development Mechanism," available on the UNFCCC website [19]. Even if considering that the Kyoto Protocol is no longer valid, the methodology, which was developed with sound principles, has criteria that remain valid. By the way, it is based on this methodology that the Brazilian Government through its Ministry of Science Technology Innovation and Communication (Brazilian Designated National Authority—DNA) publishes monthly the hourly statistics of the emissions of the electric grid. These statistics are published for both carbon credit projects, whose useful life still remains after the Kyoto Protocol and for corporate inventories [20].

The methodology discussed in this chapter is the one that is destined to inventories which reflect the Brazilian emissions on time line. It is noteworthy that unlike other countries, the Brazilian emissions, which are naturally very low among countries around world, have been worsened due to the massive insertion of intermittent renewable sources in the Brazilian electricity matrix (they need more thermo power plants in backup reserves) and by the growing difficulties of the hydrological regimes in the last 4 years.

Since 2009, Comerc using the methodology developed by itself and in partnership with Sinerconsult served more than 1600 electricity consumers with power from incentivized sources in the deregulated market. This portfolio of clients has companies of more different industries in Brazil, like chemicals, vehicles, and auto parts, food, surgical and hospitals, electroelectronics, household cleaning products, packing, personal care, paper and cellulose, leverage, and so many others.

Brazil decides that hydro plants of any size, biomass thermal plants, solar farms, wind facilities, and some qualified cogeneration plants must be considered as carbon neutral. Although it is a known fact that some hydro plants do emit greenhouse gases, the Brazilian DNA has determined that for accounting purposes in the Brazilian electric power sector, all hydro plants are to be considered as having no GHG emissions.

5. Drives to voluntary certification: Comerc/Sinerconsult

In 2008, while the severity of the climate change became increasingly clear, no companies or customers in Brazil seemed aware of the issue, apparently believing that a country with plentiful natural resources has no reason for concern. At the time, they underestimated the fact that the strong presence of hydro power plants was built in the 1960s and 1970s, and could not be considered under the Kyoto Protocol and its eventual outcomes. Ironically, if electric power plants of any age could be considered, Brazil could expect that Amazon Forest will be listed as a contribution to efforts to combat climate change.

They also disregarded the fact that the new run-of-river hydroelectrical plants developed since the 1990s would increasingly require backup from thermal plants to ensure safety and to meet operational requirements during years of unfavorable rainfall. The same mistake was made when evaluating the intermittence of wind and solar power plants (solar plants still incipient at that time).

The idea of volunteer certification was inspired by the Conference of Parties (COP), which strived for consensual decisions—a daunting challenge given the diversity of political regimens and the cultural structures of each party. A tongue-in-cheek remark—we all know how hard it is to reach consensus when allocating parking spaces in a condo homeowners' meeting, so one can only wonder about the chances when discussions involve such disparate parties. Time showed that volunteering was the winning idea in COP 21.

In a pioneering initiative in Brazil, Comerc and Sinerconsult launched certificates for avoided emissions based on the consumption of renewable energy (incentivized energy as it is called in Brazil). Our priority at the time was to create a process that was easy enough to be understood by the players, while robust enough and equipped with safeguards to ensure ethics, reliability, transparency, traceability, and coherence. All the information used is based on official data from energy contracts and their validation, as explained in the next section.

The measurement presented in the certificates, that is, tons of CO_2 avoided, might not be easily understood among lay audiences, so an indicator of equivalent reforestation was added, making it easier for the general audience to understand the dimensions of the avoided emissions by comparing it to a certain number of trees planted.

Obviously, reforestation figures could be very different numbers depending on tree types, harvest period, and spacing. For clarity, the certificate established a standard reforestation model, using calculations for avoided emissions approved for a project in the Clean Development Mechanism (CDM) in Brazil. This way, every calculation for equivalent number of trees follows the same conceptual basis, coherent with the Unite Nation International Panel of Climate Change (IPCC).

Although this methodology was created many years before the Paris Agreement, the conceptual directives defined do not conflict with the new adopted principles. Finally, it is necessary to point out that the GHG Protocol, one of the most important references in certifications around world, known to adopt conservative positions in the linkage of power plants and consuming units, adopted from 2017 a similar assumption as the Comerc-Sinerconsult model. The contract is the originating fact in establishing the environmental quality of the energy provided, to a consumer.

6. Methodology for modeling voluntary-certified avoided emission

By law, in Brazil, small power plants using renewable resources and with low environmental impact have a financial incentive in the form of discounted energy transport rates (TUSD—Distribution System Usage Tariffs, in the Portuguese

acronym). In other words, they pay a lower tariff for using the grid systems when the energy that was consumed is provided by an incentivized source.

The legislation establishes that the Regulatory Agency in Electricity Industry (ANEEL—National Electric Energy Agency, in the Portuguese acronym) must stipulate a tariff reduction of no less than 50% for transport of energy that comes from small hydro power plants, photovoltaic farms, wind power plants, and biomass-fueled thermal plants (in special sugarcane bagasse), as well some qualified cogeneration, all of plants with capacity smaller than 30 MW.

It must be detached that the benefits are allowed also for final customers. The generation facilities pay 50% of transport tariff from their site until the gravity center of the electric system and the customers pay 50% from gravity center to its location. This is in line with the ideas of Hoffman [7] discussed in Section 2.

All eligible plants for these rebates are environmentally friendly and are considered carbon neutral. Consequently, identifying a plant that has discounts is similar to identifying a source of zero emissions. Here, it is possible to identify a two-way match. The problem remains as how to ensure that the energy actually comes from a set of incentivized power plants.

To solve this issue, the information provided by the Electric Energy Trading Chamber (CCEE, in Portuguese acronym) is fundamental. The CCEE is the organization responsible (officially) for the supervision and control of electric energy trades among distributors, traders, free consumers, and generators in Brazilian market. In short, CCEE is a clearing house for electricity contracts in Brazil.

Transactions based on incentivized energy are eligible for discounted transport tariffs, so the subsidize is allocated to tariffs of all other consumers that do not use renewable of small plants [5]. For this reason, it is very important the perfect identification of whom is eligible for the discounts, because the bigger they are, the more they impact other consumers. The regulator is quite worried about the fiscalization of subsides.

The Regulation Agency (ANEEL) established that CCEE is the entity responsible to assure that the energy traded with discounts comes from a source eligible by law for this kind on incentives. Since January 2009, the CCEE has consistently published an index known as the "discount matrix," with the correlation between consumers and incentivized energy.

As related by de Almeida Prado et al. [5], the information provided from CCEE uses criterion of governance that gives confidence to stakeholders about the "quality" of energy used in each unit of consumption. The information could be checked by anyone to ensure about its reliability. All the figures are traceable and auditable and the rules are stable in time line. If a block of energy is tradable from an incentivized source and deserves the discount, we can assure that this amount of energy comes from a GHG neutral source [5].

Thus, this methodology indirectly uses an official source to determine what percentage of the power consumed by a specific consumer actually comes from a GHG neutral source. One should remember that there is always the possibility that a given power plant will be unable to produce all of the energy sold. In such situations, the generator or trader must purchase energy from third parties to honor its agreements and provide the energy it sold but is unable to deliver. If this "replacement" energy comes from other sources such as a nonincentivized, the consumer loses the right to the discount, in same proportion to the "not green" amount of energy supplied. The loss of this discount is made official by the CCEE and this procedure avoids that incorrect subsidizes could damage other stakeholders [5].

The proposed methodology uses an indirect but official inspection tool, which identifies the proportionality of the energy with incentives and therefore from sources that have zero emissions or are GHG neutral. This methodology determines how much

of the energy consumed is eligible for a transport discount and reduces the emissions published by the government for that particular month by a proportional amount.

The outcome is supported by the reliability of two official sources, one the amount of GHG emitted by the grid, and another by the exact volume of electricity consumed that was generated from renewable, GHG neutral sources. This reliability extends to the period during which the data are calculated, as both indicators are calculated for each calendar month, avoiding any distortions related to the period of calculation of these indicators.

The method used to calculate these numbers is described below. It is based on the trading chamber (CCEE) "ME001" (energy consumed) and "EI002" (TUSD incentive discount) reports.

First, the weekly consumption of energy reported in ME001 (energy consumed) reports is added up to come up with the total for the month. The amount of energy traded at a given percent discount is added and divided by the total volume, to arrive at:

$$TD = \frac{\sum VE * D}{\sum VE} \tag{1}$$

where *TD* is the total discount, *VE* is the volume of energy, and *D* is the discount.

Consumption is then multiplied by the discount to arrive at the incentive that applies to the volume of energy:

$$\mathrm{MIAE} = \sum \mathrm{WE} * \mathrm{TD} \tag{2}$$

where *MIAE* is the monthly incentive applicable energy and *WE* is the weekly consumption.

The difference between monthly consumption and the amount of incentivized energy is then used to calculate the GHG emissions avoided each month, reported as tons of CO_2 equivalents. This is calculated as a specific emission factor such as tons of CO_2eq/MWh:

$$\mathrm{AE} = (\mathrm{TMC} - \mathrm{IAEC}) * \mathrm{EF} \tag{3}$$

where *AE* is the avoided emissions, *TMC* is the total monthly consumption, *IAEC* is the incentive applicable energy consumption, and *EF* is the emission factor.

The procedures described herein abide by the generally accepted principles for calculating inventory, which are relevance, universality, precision, transparency, and consistency. All of them are connected with the good practices presently discussed in Paris Agreement. Calculating avoided GHG emissions is a simple and reliable process if one has access to the customer reports issued by the CCEE regarding electricity consumption, specifically ME001 and EI002. Such reports are available only for customers, but of course they can, if necessary, give open access to anyone charged with checking the figures [5].

7. Results

The results obtained are substantial and represent a pioneering initiative in voluntary measures to reduce GHG emissions in Brazil. **Table 1** presents the results of 900 different companies, with more than 1600 consumer units that have been using this methodology since 2009.

Year	Number of certificates	Ton CO_2eq	Number of equivalent trees
2009	75	21,279.70	121,787.44
2010	75	76,900.86	440,117.14
2011	120	66,334.57	358,203.24
2012	192	111,248.36	778,738.53
2013	385	344,337.79	2,410,364.53
2014	474	528,496.53	3,699,475.71
2015	326	550,516.87	3,853,618.09
2016	996	473,668.40	3,315,678.82
2017	1130	701,854.64	4,912,982.48
Σ	3773	2,874,637.72	19,890,966

Table 1.
Figures of Comerc Sinerconsult certificates (2009–2017).

8. Next steps

As discussed above, climate change is increasingly becoming a serious issue in light of the severe effects it might produce in human life. The pioneering Comerc-Sinerconsult initiative is not the only option available today. There are other initiatives, for example, from the Brazilian Society for Wind Power (Abeeolica, in the Portuguese acronym), and from associations of sugar and alcohol producers, and even international entities, for example, GHG Protocol and the International REC Standard.

It is clear that ongoing regulatory follow-up must be part of all joint activities undertaken by certificate sponsors, who should be open to include enhancements and committed to the continuous improvement of the project.

Since 2017, Comerc developed similar concepts for the certification of energy efficiency. The emission factors in this case are obviously not the same as those utilized in corporate inventories neither the conserved energy is defined by the Chamber of Energy Commercialization (CCEE). However, the methodologies developed were maintained regarding ethics, reliability, transparency, and coherence. Comerc also maintained the equivalence with reforestation for a clearer presentation of figures to a nonexpert audience. The first certificates were already checked and will be expanded quickly as the energy efficiency actions are more valued in Brazil.

As the concepts from the Paris Agreement become consolidated, it will be possible to develop new activities with the "potential" commercialization of certificates and its utilization for the neutralization of events or transferences among companies of the same group. Any such steps will be developed with the caution that characterized the creation of the certificates.

9. Conclusion

In the authors' opinions, voluntary certification represents a path of no return for public projects and policies related to climate change.

The references presented in the Section 2 section indicate that consumers may exert pressure on the supply chain in different markets. This perception is aligned with Comerc experience in Commercial Relations and Marketing: more than 900 corporations receive the emission certificates today.

No one of these initiatives are easy to control, the visited literature indicates the need to take care of the metrics calculation, so that it is possible to offer reliability to the stakeholders in the use the data of these voluntary initiatives, for commercial planning, company records, environmental compliance reports, or commercial and marketing policy actions.

The methodology described by the authors brings in their control, mechanisms very robust and criteria that offer security and reliability in the figures obtained.

The methodology proposed by Comerc-Sinerconsult was the pioneer in Brazil for this type of action. Given the theme's importance, innumerous other initiatives have arisen since the first certificates were emitted in 2009. It is important to note that the GHG Protocol, important reference that internationally had very strict criteria for the accounting of GHG emissions in interconnected grids began to use criteria similar to the Comerc-Sinerconsult since 2017. It demonstrates how important voluntary initiatives are, because they promote learning by the need to create and develop pioneering criteria and end up transforming the market in an evolutionary sense. The very transformation of a set of mandatory rules originating in Kyoto seems to find more appropriate conditions for its success now with the voluntarism of the Paris Agreement.

This chapter presented the pioneering initiative led by Comerc and Sinerconsult, creating the first avoided emission certificates in Brazil. Since 2009, we have reported almost 3 million tons of equivalent CO_2 that are no longer released into the atmosphere due to the commercialization of renewable energy from small-scale projects with low or no environmental impacts. This volume of emissions is equivalent to a reforestation of approximately 20 million of trees and involved the participation of 900 companies with more than 1600 consumer units, all of them Comerc clients purchasing renewable energy or undertaking energy efficiency actions.

New perspectives are open now with the Paris Agreement that priories volunteer initiatives. The authors believe that in short time new markets of certification will result from similar initiatives. The path probably will be the commercialization of certificates and its utilization for the neutralization of events or transferences among companies of the same group. Any such steps must be developed with the caution that characterized the creation of the certificates here described.

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