

# Construction and Legal aspects of a Solar Farm in Brazil

Wilker Camargo Ferreira<sup>1</sup>, Livia da Silva Oliveira<sup>2</sup>, Jean Mark Lobo de Oliveira<sup>3</sup>, David Barbosa de Alencar<sup>4</sup>

<sup>1,2,3</sup> Academic department, University Center FAMETRO, Manaus-AM, Brazil

<sup>4</sup>Research department, Institute of Technology and Education Galileo of Amazon – ITEGAM, Manaus-AM, Brazil

**Abstract**— The objective of this article was to show all the necessary steps for the construction of a Solar Farm and the legal procedures that involve this new area, so promising and sustainable, with zero impact on the environment compared to traditional forms. The Solar Farm is not necessarily created on rural properties, contrary to what many people think. In fact, it is a large-scale Photovoltaic Solar Plant, installed in a region with ideal conditions for the generation of photovoltaic solar energy in optimal transmission conditions. The Solar Farm is connected to the energy grid, and starts to generate electricity that can be used by several customers. This is because the energy executed is transformed into credits, which can be practiced anywhere. From then on, it is possible to earn quotas of supply produced by Fazenda Solar, which allows profits to be used to reduce the huge energy bill that takes the sleep of all Brazilians.

**Keywords**— Solar farm; Photovoltaic; Machining; Electrical network.

## I. INTRODUCTION

The photovoltaic system has different capacities for different audiences, in relation to a business or a house, only a few plates will be needed so that the energy generated in the environment is consumed right there, but a solar farm requires thousands of plates, because the energy generated is for consumers.

The solar farm had its prelude in the 90s, in Germany, and it was there that farmers coined the term “solar farm” (in English: “solar farms”).

These “crops” of solar energy had a great growth in Germany due to the incentives that the government promoted around the technology, with that the solar farmers began to use their own land and the generation of photovoltaic energy to earn income.

What differentiates the solar plant from a solar farm is only where it is installed. By definition a solar plant that is in agricultural territory is a solar farm.

A farm or solar plant can be characterized as projects developed to provide lower cost electricity to yourself or others.



Fig. 1: Nova Olinda solar farm.

Source: conexaoplaneta,2020

Brazil Bank, by the end of 2019, will be able to exceed 10% of the agreed partners that supply solar energy. In this way, there will be solar energy agencies in the Federal District (30 units), and Goiás (plus 39) and Pará (39). The period of 120 days for the sanction will only be counted from the stage of legal procedures. To date, there are 296 agencies responsible for supplying solar energy, taking into account the Minas Gerais agencies in the first phase.

## II. THEORETICAL REFERENCE

Taking advantage of the resources provided by the Sun, the photovoltaic energy system would benefit from

light and heat to create energy. The conversion of light into electricity was due to photovoltaic cells. The system consists of a set of photovoltaic panels and devices that perform the conversion.

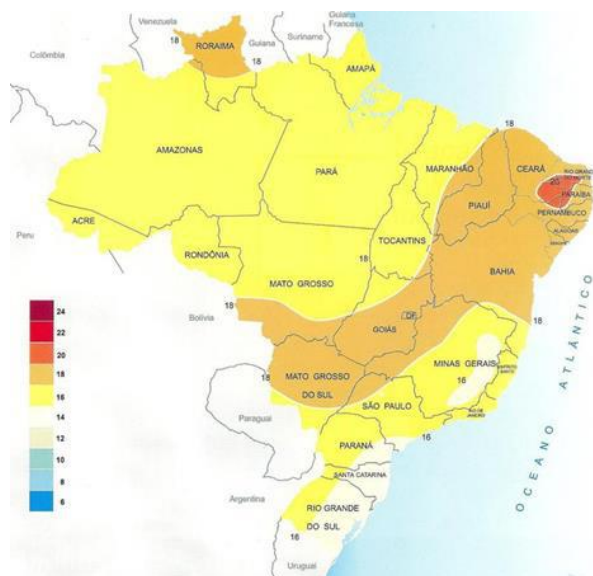


Fig. 2: Solarimetric Atlas of Brazil.

Source: Obeabadosertao, 2020

## 2.1 Current situation of photovoltaic energy

In the 90s the German government started to encourage renewable energy sources, especially solar energy. Thus, solar farms (set of panels installed in large areas) emerged. It is currently in India that the largest solar farm in the world resides in Kamuthi and has a capacity of 648MW. Another country has also invested in solar farms, such as Egypt, which in 2018 created its first plant and employed 4,000 people and further, in 2019, it will inaugurate a solar farm composed of 30 plants and will have the capacity to generate up to 1.8 giga watts. Even with the excess of territory available for the creation of solar farms, only registered companies are allowed to sell energy to the distributors. However, the law allows licensed companies to negotiate with distributors to remove land, with the aim of developing from solar farms.

In 2012, more specifically in April, ANEEL declared Normative Resolution No. 482/2012, which defined how energy creation would be standardized. With this, an agreement was made through determinations of the compensation system that made the active energy injected into the network with the distribution unit and finally given to the distributor, which was previously compensated.

This process has encouraged numerous countries in Latin America to develop PV systems.

## III. MATERIALS AND METHODS

### 3.1 Construction processes for a Solar Farm.

#### 1 - Process

Prior to the beginning of the development of the solar farm, it is essential to identify the place where it will be generated.

However, the location alone is not enough, legal approval is also essential for the project design.

The environment that must preside over solar photovoltaic plants has to be vast. Since the photovoltaic panels are huge and need sunlight. In addition, the project, belonging to the Solar Farm, requires an authorization requirement before the environmental, health and safety bodies, among others.

#### 2 – Process

The other fundamental procedure for the development of a solar farm is the indication of the connection point to the grid.

Local authorities usually provide the connection point. However, some important issues must be negotiated. This situation occurs due to the high cost of the project, due to the connection points, and billing.

First, the network must have the capacity to absorb the maximum result of the photovoltaic solar station.

After that, the person responsible for the project has to meet the conditions for the cost of delivering power lines to the connection point. It still has the extra expenses that can occur in advances in the network for better energy absorption.

However, with efficient preparation and defined partnerships with the network agents in the regions, these expenses can be reduced or eliminated.

#### 3 – Process

To advance this phase, some relevant achievements are necessary, such as:

- The production of documents, related to the project;
- Obtaining rights to the territory;
- Construction authorization.

It is also during this period that the Energy Purchase Agreement is signed. Thus, the extensive time for the development of the Solar Farm is ensured. In relation to laws 482/12 and 687/15 of the National Electric Energy Agency (ANEEL), responsible for regulating the connection to the grid of photovoltaic systems, it is essential that you have full knowledge about these laws.

Soon after bureaucratic and contractual issues are resolved, infrastructure development begins. When the work is finished and working, there is the need to obtain machinery and logistical assistance.

#### 4 – Process

The real development method, for solar photovoltaic farms, implies the fundamental methods used, normally, for projects of this size.

In the farms, solar panels on the ground, devices that allow a quick installation, are used.

In addition to the floor mounting systems, the device's ease and effectiveness is naturally perceived.

Consisting of stainless steel and aluminum fasteners, the solar panels are built on support made from these elements, thus ensuring greater resistance.

To mitigate development and execution costs, it is common to use stable equipment with a fixed installation angle for photovoltaic panels.

The photovoltaic modules are attached to transverse beams, on which they have aluminum support.

With the addition of "trackers", the panels enable the improvement of solar irradiation, having the ability to supply, on average, up to 45% more energy than a stable system of similar dimensions.

#### 5 – Process

At this stage, according to the contract with the local authorities established during the pre-construction, it is already possible to connect the Solar farm to the grid

Monitoring systems are also used, being placed and ready for remote monitoring, in relation to the power plant. In addition, there is still an opportunity for you to implement behavior indicators, so that the photovoltaic doing can have its performance monitored.

Solar panels are satisfactory systems, in terms of durability and resistance, so the need for more complex maintenance is unusual. A solar farm has, on average, 25 to 30 years of useful life and 10 to 15 years is the average time that solar inverters last.

#### 3.2 Energy Productions in Brazil.

In August 2019 the company Absolar made a bibliographic study in which it determined that there are 93,597 distributed generation facilities in Brazil, capable of generating a total of 1 gigawatt (GW). In this study, the field represents 5.5% of the systems connected to the network in Brazil, lagging behind sectors of commerce, services and residences. And with 9.8% of the installed

capacity, the field is still behind services, homes, shops and industries.

Among one of the main pretexts for the sector to promote this type of energy source, it should thanks to the reduction of the environmental impact, reduction of expenses, variation of the energy matrix and the credit available. According to the study by Absolver, there are more than 70 possibilities for financial contributions from agents, public or private, to numerous areas of the economy in Brazil.

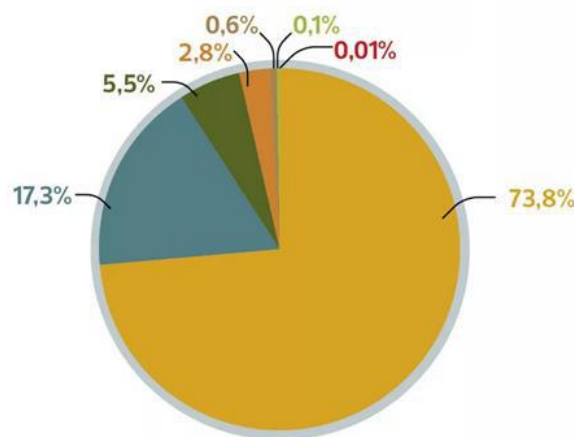


Fig. 3: Number of Systems.

Source: Absolar.

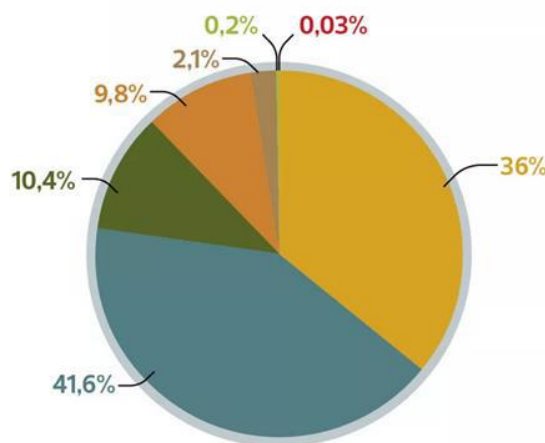


Fig. 4: Installed power.

Source: Absolar.

## IV. RESULTS AND DISCUSSION

Being an exceptional choice for the creation of electric energy, photovoltaic solar energy also brings with it clean and sustainable energy, as it does not have CO2 emissions. And the cleaner energies have been popularized and used, the less will be our need to use sources that can harm our ecosystem. Nowadays, energy

sources such as thermoelectric power plants, which pour CO<sub>2</sub> into the atmosphere, and hydroelectric power plants, which destroy the local ecosystem, are quite common, which in general are anti-ecological practices. With that said, photovoltaic solar energy becomes attractive because it is clean energy and uses one of the most abundant resources in Brazil, the solar wave, especially in the state of Minas Gerais, where the plant that is a reference in Brazil is located. Solar plant waves.

Regarding the regulation on GD - "Generation Distribution" Normative Resolution n° 482/2012, or known as RN 482, of ANEEL - "National Electric Energy Agency" determines the circumstances for the admission of microgeneration and mini-generation to the Electric Energy Compensation, in addition to electric energy distribution. In this way, allowing the consumer to apply the spare energy of their production to the local energy distribution network, producing future credits.

The National Electric Energy Agency (ANEEL) examined and reconsidered the GD rules, using Normative Resolution No. 687/2015 as a justification. Among the novelties it is worth mentioning:

- The permission for the development of generator condominiums, where owners of individual consumer cells share the credits among the various electricity operations. This premise is called: Enterprise with Multiple Consumer Units;
- The adoption of the Shared Generation standard for consumers, which allows a single generation installation to have its credits, of energy, shared by several users;
- The increase in power that allows generators to reach up to 5 Megawatts (MW);
- Credits generated by self-production are valid for up to 5 years (or 60 months);

The innovations determined by RN 687/2015 had a good reception, but undeniably the one that stood out the most was the creation of Shared Generation, since the possibility of distributing a large generating unit and enjoying the school economy has several benefits.

In addition, the norm that determines the generation model in which a group of people (Individuals or Legal entities) joins through a Consortium or Cooperative in order to produce energy is in the fourth paragraph of article 2 of RN 482:

- Art. 2°
- VII - shared generation: characterized by the gathering of consumers, within the same concession or

permission area, through a consortium or cooperative, composed of an individual or legal entity, which has a consumer unit with microgeneration or mini-generation distributed in a different location from the consumer units in which the surplus energy will be offset; (Included by REN ANEEL 687, dated 11/24/2015).

The solar energy farm is characterized by its photovoltaic panels placed in a rural area or field, thus allowing energy users to save energy without having to purchase a particular system. Therefore, in Brazil, it is necessary that the solar energy farm is built in an appropriate area for multiple properties to enjoy.

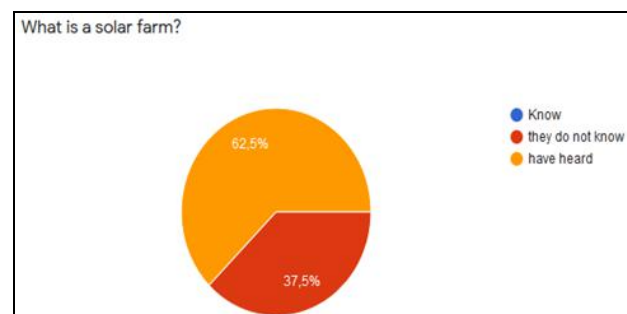


Fig. 5: What is Solar Farm?

Source: Authorship.

First, the area in which it will be determined to build the solar farm must comply with the level of sunshine in the area, as this way the effectiveness of the solar farm will be higher, thereby producing a lot of energy for the dependent units.

In this way, the energy conceived by sunlight will be sent to the public distribution network, where it will start to recapacitate the energy generated so that it can be transformed into credits, valid for 60 months.

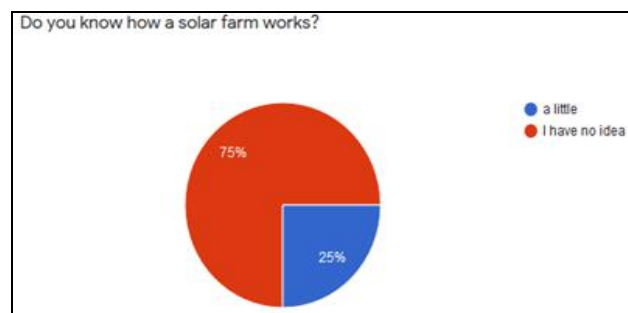


Fig. 6: Knowledge about the operation.

Source: Authorship.

Consuming the energy produced with only part of the solar farm, using solar photovoltaic energy, there will already be a discount on the electricity bill, by your



distributor, due to the energy credits capable of restoring the electricity consumption, which was used.

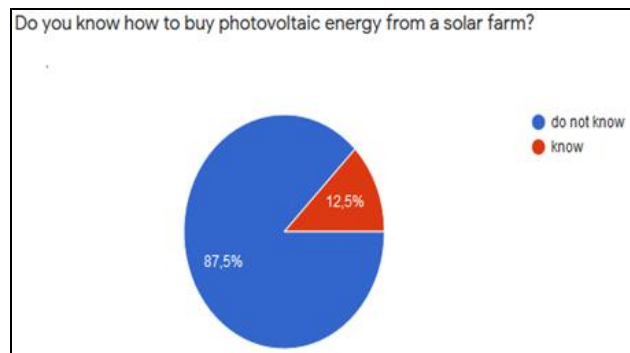


Fig. 7: Knowledge about purchasing energy.

Source: Authorship..

## V. CONCLUSION

It can be concluded from this article that clean energy sources, especially solar energy, have become more and more popular, as the demand for sustainable energy has to be becoming a necessity for several nations. In Brazil, the development of photovoltaic energy is still maturing, in other countries. Even if there is a visible capacity for growth. This article also exposes the need to prioritize laws that protect the environment, even if at the expense of large businessmen.

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