



ENVIRONMENTAL LICENSING IN BRAZIL: A SIMPLIFIED GUIDELINE FOR CONCENTRATED SOLAR POWER (CSP) PROJECTS

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ENVIRONMENTAL LICENSING IN BRAZIL: A SIMPLIFIED GUIDELINE FOR CONCENTRATED SOLAR POWER (CSP) PROJECTS

ABSTRACT: Concentrated Solar Power (CSP) foresees energy production in co-generation, allowing the efficient use of heat for industrial purposes and electricity generation. CSP plants can be constructed in focusing solar light into a receiving tower or using a heat transfer fluid for the thermal processes. These different types of CSP systems have a varying range of environmental impacts. The understanding of the environmental impacts of such systems is the basis for hindering the complexity of the licensing process for construction and operation of CSP plants. The existing restrictions in the licensing process lead to unnecessary delays and significant increase of costs during the project planning phase. The absence of specific environmental legislation for CSP plants in Brazil creates misunderstandings during the evaluation of such facilities. To cope with these problems this paper presents a roadmap for obtaining the environmental licenses. Based on the analysis of the requirements for the licensing procedures, we developed a balanced proposal for the establishment of a licensing guideline which fits to CSP plants. This guideline should support international and national business launchers in the implementation of CSP projects; thus creating the essential basis for further development of the CSP market in Brazil.

KEYWORDS: Concentrated Solar Power, Brazilian environmental legislation, licensing procedures.

1. INTRODUCTION

The Brazilian government is seeking reliable and renewable options to diversify its energy matrix. Renewable energy already plays an important role in Brazil. Hydropower covers approximately 66% of the total electricity matrix (EPE, 2015). However, the expansion of this energy source is not foreseen. The Brazilian water unexplored potential is located in the Amazon region. The construction of water dams in conservation sites mostly involves negative environmental and socio-economic impacts (LEDEC; QUINTERO, 2003). Furthermore, the Northeast, Midwest and part of the Southeast region have been suffering due to the lower than expected rainfalls. This caused a significantly reduction of water levels in the reservoirs of hydroelectric plants. In 2014, this led to a more intensive use of thermal power plants to meet electricity demand. These plants use mostly fossil fuels like coal and natural gas, which are extremely expensive and generate greenhouse gases.

However, it is noted that other renewable energy sources, like solar energy is almost not explored despite of the abundant availability of direct solar irradiation in the country, especially in the Northeast, Midwest and part of the Southeast region. The total installed capacity of solar energy in Brazil represents less than 1% of the Brazilian energy matrix (EPE, 2015). Hence, there is an urgent need on diversification of the Brazilian energy matrix.

Brazil has extensive semi-arid regions in the São Francisco River Basin and the Sobradinho areas in the Northeast. Potential sites in Brazil are close to the equator and this has an optical advantage. Immense land areas are available for

solar thermal applications. They have excellent topographic conditions, grid access, cooling water, road access, low wind speeds, and moderate ambient temperatures with little daily variation.

Solar energy can be exploited in three ways: (1) the production of thermal energy for residential, commercial or industrial applications; (2) power generation using photovoltaic panels for direct conversion into electricity; or (3) by Concentrated Solar Power (CSP) technologies, where systems of solar radiation concentration are used to heat significant quantities of fluid to high temperatures for application in thermal power cycles.

CSP is a proven energy technology with a 30-year track record (POOL; COGGIN, 2013). The different CSP technologies are classified in relation to the characteristics of the mirror system: (1) parabolic troughs; (2) parabolic dishes; (3) heliostats, focused on a receptor located in a tower and (4) linear Fresnel reflectors, where no solar tracking is needed (GUERRERO-LEMUS; MARTÍNEZ-DUART, 2013).

High-temperature concentrated solar energy can be used for co-generation of electricity and process heat. In this case, the primary energy input is used with efficiencies of up to 85%. Possible applications cover the combined production of industrial heat, district cooling and sea water desalination (DLR, 2005; IEA, 2011). This kind of system is ideal for industries with combined demand, favouring the energy efficiency. Further benefits of CSP are: an increase in the diversity of the energy supply; reduction of GHG emissions; long-term energy generation, creation of employment in rural and urban regions,

offering opportunities for the local production of energy technology and strengthening of the supply security as no imports are required (DLR, 2005; IEA, 2011).

A further advantage of CSP in relation to conventional solar energy is the perspective to expand their time of solar operation to base load using thermal energy storage and larger collector fields. Solar heat collected during the daytime can be stored in storage systems based on concrete, molten salt, ceramics, or phase change materials. At night, it can be extracted from the storage to run the power block continuously (NEEDS, 2009).

CSP is a low environmental impact technology when compared to fossil fuels (VIEBAHN *et al.*, 2011; HERNANDEZ *et al.* 2014). Unlike solar photovoltaics, which require large amounts of scarce materials such as silicon, copper indium selenide, or cadmium telluride, CSP plants are made from low-cost and durable materials such as steel and glass.

Unfavourable effects of CSP are usually minor and they can be minimized by appropriate mitigation measures (TSOUTSOS *et al.*, 2005). For an example, it has been documented by several authors that water consumption in the CSP plants could represent a constraint in semi-arid areas. However, this could be solved by applying dry cooling. Water consumption for dry cooling at CSP, biopower, and natural gas combined cycle plants is an order of magnitude less than for recirculating cooling at each of those types of plants (MACKNICK *et al.*, 2011).

The first CSP initiative in Brazil was launched by the government in 2010, when an agreement was signed between the Ministry of Mines and Energy (MME), the Research Centre for Electrical Energy (CEPEL) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) to support the development of a pilot CSP plant in Northeast Brazil. Currently, CEPEL is developing a solar thermal research facility (heliothermic) near the city of Petrolina. The heliothermic project consists of three phases: (1) Construction of a 1 MW parabolic trough plant, (2) Addition of a thermal storage energy system, (3) Development of other technologies such as solar tower or linear Fresnel. This facility should supply approximately 1,000 inhabitants with electricity. The first phase of the project has a total budget of R\$ 28.3 million and was officially started in December 2012 with the submission of a detailed documentation including Environmental and Impact Assessment (EIA) and other important reports like the archaeological heritage report, for obtaining the environmental permission to construct the plant (ELETROBRAS CEPEL, 2012).

Since 2013, CSP has been included in national energy auctions. A total of 10 projects amounting 290 MW of CSP have been filed with the Brazilian Energy Research Agency (EPE). The projects participated in the A-3/2013 energy auction. The CSP projects will be located in the Northeast. Eight projects (240 MW) have been applied for Bahia while the two remaining totalling 50 MW are planned for Paraíba. The approved projects will begin delivering electricity by January 1, 2016 under a 20 years contract (CSP-WORLD, 2013).

Since 1981, environmental licensing is a legal obligation. The Brazilian Ministry of the Environment coordinates, supervises and implements national

policies. The National Environmental Council (CONAMA) and the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) were created in order to facilitate the licensing process. Hence, before any potentially damaging and polluting activities take place in any part of Brazil's territory, the entrepreneur must apply for the licenses of construction and operation of the facilities.

Currently, the process of obtaining the environmental licenses in Brazil is considered complex, demanding time and a considerable amount of money. Countries with simplified environmental licensing procedures for renewable energy, like Germany and Spain, are seeing the most progress in replacing fossil fuel-based power with renewable energy. They indirectly encourage manufacturers to increase design in renewable technologies and to invest in R&D activities. Among the various incentives implemented by the different member states, the renewable feed-in tariffs chosen by Germany and Spain have been the most successful in Europe in creating additional renewable energy generation.

Since 1994, consistent legislation has led to the development of more than sixty new projects, making Spain the world's leader in CSP. Since 2002, Spain has been making efforts in developing less complex ways to obtaining environmental licenses for the implementation of CSP projects. Mostly, the complete licensing process takes between three and four years. The development of a CSP plant involves several entities at local, regional and country levels for its approval. As an example, the Council for Innovation and Development in the Region of Andalusia is responsible for approving the

Declaration of Public Use, the Environmental Impact Assessment and the Execution plan. The Town Council should be responsible only for the Construction and Operation Licenses. Although the tasks are well divided, the entities are connected in order to accelerate the process (FRISARI; FÉAS, 2014).

Considering the absence of a specific environmental legislation for CSP in Brazil and a lack of experience regarding the characteristics of CSP plants and its environmental impacts, there is a need to discuss the current licensing procedures in order to find out possible recommendations to simplify the process of implementing CSP projects in the future.

2. MATERIAL AND METHODS

The purpose of developing a guideline for environmental licensing is to provide a simplified way to apply for the licenses in Brazil. The first step is to identify which licensing agency is responsible for the process. It may be the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), or the Federal States and municipal agencies. Each Brazilian Federal State has its own environmental regulation office, which is responsible for issuing environmental licenses for projects and activities being held within the states border. Nevertheless, there are some cases when the IBAMA itself must grant the environmental license (CONAMA 237/97).

The IBAMA licenses ventures involving more than one state or interfere with federal conservation units. The Federal States and municipalities license

ventures with regional and local impacts, respectively. Whereas most Brazilian cities do not have infrastructure and trained agents, the more likely it is that most CSP projects should be licensed in the Federal State agencies.

It is a responsibility from IBAMA to classify each project, so it is possible to define what kind of environmental studies it must conduct, in order to obtain the environmental licenses, and whether IBAMA itself or a local environmental office should make the license issuing. This classification regards, not only, the projects pollution potential, but also mainly its location.

The IBAMA should make the environmental licensing of any project and activity that presents some regional or national environmental impact. By regional environmental impact, the resolution CONAMA 237/97 explains, to be any impact that attains two or more Federal States. The national environmental impact is any that attain both Brazil and a border country, indigenous lands, areas of environmental protection, military territories and any activity related to radioactive materials. The IBAMA licenses activities which modify the environment.

The environmental licensing procedures in Brazil consists of obtaining three main licenses, which are described under the decree number 99274/90 with further details under the National Counsel for the Environment (CONAMA) resolution number 237/97. The licensing procedures may vary according to the projects size, location and pollution potential and requests the execution of several environmental studies, in order to issue the licenses. Mostly, the

environmental licensing process takes between two and three years for its completion.

The legislation in each Federal State has its own specifications. Power plants to be constructed in the Federal State of São Paulo have specifications which differ from the other Federal States. For example, the Simplified Environmental Study (EAS) and Simplified Environmental Report (RAS) are regulated for the Federal State of São Paulo, under the environmental agency CETESB. However, there is a general licensing procedure for the whole country, based on the three main obligatory licenses: Preliminary License (LP); Installation License (LI) and Operation License (LO).

The classification regarding the environmental impact determines whether the activity should follow the regular environmental studies procedures or the simplified procedures, for low environmental impact activities. Nevertheless, wind power plants and other alternative energy power plants, among other energy generation ventures, are permitted to use the simplified procedures, however, there are several exceptions (CONAMA, 279/01).

Since 1994, the IBAMA has standardized procedures for environmental licensing, establishing 2 primary instruments to EIA and RIMA: the Preliminary Environmental Report (RAP) and the Reference Term (TR). RAP is the first document for obtaining the Environmental License and has the objective to justify the decision of the environmental authority regarding the requirement or waiver of the EIA and RIMA, to obtain the Preliminary License (LP).

In case of requirement of EIA and RIMA, the Preliminary Environmental Report (RAP), along with other instruments, subsidizes the preparation of Terms of Reference (TR) for the EIA and RIMA to be performed. From the EIA and RIMA (required by the environmental agency based on RAP) or RAP (when the environmental agency dismissed the preparation of the EIA and RIMA, it is sought to obtain environmental licenses. Thus, at the State of São Paulo, for obtaining the environmental licenses (LP, LI and LO), the entrepreneur should follow the following sequence of preparation of documents: RAP, TR, EIA and RIMA. In cases where it is not necessary the preparation of the EIA and RIMA, the process is simplified. It is only necessary the fulfillment of RAP and the process goes directly to obtaining the licenses, without the need of performing EIA and RIMA.

Preliminary License (LP)

The Preliminary License (LP) must be issued during the design phase of the project and it is a requirement to obtain the other two main licenses. It contains the basic requirements which the project must fulfill in the location, installation and operation phase, in order to receive the remaining licenses. Furthermore, it is necessary to provide Environmental Impact Assessment reports that describe the negative impacts and mitigation proposals, as well as the positive impact and maximization proposals.

The LP attests to the environmental feasibility of the project, but does not allow the start of work. It is the longest stage and where the greatest efforts

occur, both the entrepreneur as the licensing body. At this stage it is necessary that the entrepreneur already has the basics of project work. The steps for obtaining the LP are:

Initiation of procedures

The entrepreneur makes the protocol to environmental agency with basic information of the enterprise.

Terms of Reference (TR)

The environmental agency defines the licensing route (simplified or regular) and issues a TR with the items to be considered in environmental studies. When the TR requires that the fauna of the study is made by capturing animals, it is obligatory to present the Permit for Collection and Transportation of Fauna. Environmental studies are an important part of the preliminary license procedure and can cost up to 20% of the final project budget. According to the CONAMA resolution number 237/97, the regular environmental studies consist of two documents:

- Environmental Impact Studies (EIA) and Environmental Impact Report (RIMA): are used in the regular licenses. The EIA is a technical and scientific report to support the decision making of the environmental agency, while the RIMA is an EIA summary written in language accessible to the public and it should be available to the community;
- Simplified Environmental Report (RAS): used in the simplified licensing.

These studies are necessary for power plants, considering any form of primary energy source, which operates above 10 MW. The EIA and RIMA are basically divided into 3 parts. The first is the diagnosis of the environmental situation of the project site, addressing the physical (climate, geology, etc.), biological (flora and fauna) and anthropological (socioeconomics, traditional communities, etc.). The second part is made by the prognosis of positive and negative environmental impacts, considering different methods and alternatives included in the project. In the last part, it is suggested the mitigation measures, compensatory and environmental programs.

The **Environmental Impact Assessment (EIA)** is the set of studies by specialists in various areas, with detailed technical data. The access to this document is restricted due to industrial and commercial secrecy. The EIA reports the area of influence of the full project description and the resources and their interactions, in order to characterize the environmental situation of the area prior to the implementation of the project, considering:

- The physical environment: soil and subsoil, water resources, air and climate, mineral resources, topography, hydrology, ocean currents and air currents
- The biological environment and natural ecosystems: fauna and flora, highlighting species of environmental quality, scientific and economic values, rare and endangered and permanent preservation areas
- The social and economic environment: use and occupation of land, highlighting the sites and archaeological, historical and cultural

monuments of the area, the interdependency relationships between the local community, environmental resources and the potential future use of these resources

- The analysis of the project's environmental impacts and its alternatives, by identifying, predicting the magnitude and interpretation of the significance of the likely significant impacts, detailing: positive and negative impacts (beneficial and adverse), direct and indirect, immediate and medium and long term, permanent and temporary; the degree of reversibility; their cumulative and synergistic properties; the distribution of social benefits and burdens.
- Definition of measures to mitigate adverse impacts, including equipment control and treatment of sewage systems, evaluating the effectiveness of each.
- Development of the monitoring program (positive and negative impacts, indicating the factors and parameters to be considered).

The **Environmental Impact Report (RIMA)** reflects the conclusions of the Environmental Impact Assessment (EIA). RIMA must be presented in an objective and properly way. The information must be translated into accessible language, illustrated with maps, charts, tables, graphs and other techniques of visual communication, so that they can understand the advantages and disadvantages of the project, as well as all the environmental consequences of its implementation. **RIMA** must contain the following items:

- The objectives and justification of the project, its relationship and compatibility with policies, plans and government programs;
- A project description and its technological and location alternatives, specifying for each of them, during the construction and operation area of influence, the materials, and hand labor, energy sources, processes and technical operational, likely effluents, emissions, energy waste, the direct and indirect jobs to be generated;
- A synthesis of the results of studies of environmental diagnostics of the project's influence area;
- A description of the likely environmental impacts of the implementation and operation of the activity, considering the project, its alternatives, the incidence of time horizons of impacts and indicating the methods, techniques and criteria used for identification, quantification and interpretation;
- Characterization of future environmental quality of the area of influence, comparing the different situations of the adoption of the project and its alternatives, as well as the possibility of its fulfillment;
- A description of the expected effects of the mitigation measures proposed concerning negative impacts, mentioning those who could not be avoided, and the expected degree of change;
- The program for impact monitoring;
- Recommendation regarding a more favorable alternative (conclusions and general comments).

Thus, for energy generation projects, there are two main licensing procedures: the regular process, utilizing the EIA and RIMA, and the simplified process, utilizing the RAS. Complementing the RAS, there are the Environmental Control Report (RCA) and the Environmental Control Plan (PCA). These are documents that characterize the project from the physical, biological and socio-economic environment in regional terms even in local terms, in addition to detailing the activities to be developed by entrepreneur.

Through the RCA the entrepreneur identifies actual or potential arising from the installation and operation of the project for which you are required to license. PCA is the document through which the entrepreneur presents the plans and projects that can prevent and/or control the impacts environmental arising from the installation and operation of the project for which the license is being requested, as well as to correct the non-compliances identified. The PCA is always necessary, regardless of the requirement or not of EIA and RIMA. The PCA should be delivered at the LI application.

The Preliminary Environmental Report (RAP) is a more regular study than RAS, also is necessary to support the environmental agency in obtaining environmental license process. RAP is required for activities or projects with potentially or actually causing environmental impact. If RAP is technically sufficient to the licensing process of the project to be based at and if there is no legal impediment, the environmental agency shall approve the application of environmental license determining the adoption of mitigation measures or else, if it deems appropriate for technical and legal grounds, may require more complex environmental studies, as EIA and RIMA.

The Degraded Areas Recovery Plan (PRAD) is the plan that will qualify the environmental impacts caused by the project and indicate which activities should be developed for the recovery of the area, showing the mitigation measures that should be undertaken to reduce these impacts.

Delivery of the Environmental Studies EIA and RIMA

The entrepreneur protocols the studies in the environmental agency. Along with the protocol of the environmental studies, the entrepreneur must make the legal publication in the official gazette and elsewhere newspaper stating that he is requiring the LP. There is a deadline of 45 days for publishing the requirement of the public hearing, which can be requested by more than 50 citizens or by the Public Ministry.

Analysis of the Environmental Studies

The environmental agency verifies that the TR has been met or if there is need for supplements.

Public Hearing

It is only necessary for the regular licenses.

Field Survey

In almost all the cases, the environmental agency makes a field visit to check critical points found in the environmental studies.

Release of LP

If the environmental agency agrees that the project is feasible, it will issue the LP pointing environmental programs to be developed in the next stages and setting certain conditions that must be met for LI's (License of Installation) application. After the issue of the LP, the entrepreneur must provide the legal publication. An important aspect of the licensing process is the deadline, which the environment office, either IBAMA or a regional one, has to issue the required license. That time is also influenced by the projects classification and can vary from 2 to 12 months, depending if it is the regular or the simplified process and which environmental study to be made. The deadline starts counting as soon as the environmental office register the application for the preliminary license and its period is:

- Six (6) months for regular process with RCA;
- Twelve (12) months for regular process with EIA and RIMA;
- Sixty (60) days for simplified processed, but it is possible to add 60 more days, when needed.

The LP is valid for a period of, maximum, 5 years after its issue. That means the entrepreneur has this time period to fulfill the conditions stated the license in order to apply for the installation license (LI).

Installation License (LI)

The LI authorizes the start of works and is issued in a shorter time compared to the LP. At this stage the basics of project design should be clarified, next to the executive project. The areas of the structures and access facilities must be set, as well as the volumes of materials, such as deposits, excavations, waste, etc. The LI can only be granted if the requirements, stated in the LP, are fulfilled. In addition, it provides detailed information regarding the positive impact maximization measures and the negative impact mitigation measures, as well as the environmental monitoring systems. The LP is a prerequisite to start the projects execution. The steps to obtain the LI are:

Application of LI

LI to the application the entrepreneur must submit the following documents:

- **Basic Environmental Project (PBA):** details of environmental projects to be implemented during construction. By analogy, one can say that the PBA is the "environmental executive project." Periodic reports are sent to the environmental agency reporting progress of the PBA programs. At this stage can occur surveys by the environmental agency. In simplified licensing, this report is called the Detailed Report of Environmental Programs (RDPA) that is simpler than the PBA.
- **Forest Inventory:** it is necessary only in cases of removal of vegetation to obtain Vegetation Suppression Authorization (ASV).

- Environmental Compensation Plan: need for complex projects. Under federal law, there are resources application needed (money) in protected areas that can reach up to 0.5% of the venture. This percentage varies by state and some charge including simplified licensing.

The entrepreneurs already initiate the preparation of the above documents after the application of the LP. With this, usually the LI request occurs immediately after issuing the LP.

Issue of LI

The environmental agency analyzes the above documents. The agency either releases the LI or requests supplements, depending on the full attending to the requirements of LP. After the issue of the LI, the entrepreneur must provide the legal publication in the official gazette and elsewhere newspaper stating that is requiring the LI.

The installation license deadline starts counting as soon as the environmental office registers the application for the license. The time for each class is:

- 6 months for regular process with RCA;
- 12 months for regular process with EIA/RIMA;
- 60 days for simplified processed, but it is possible to add 60 more days, when needed.

The installation license is valid for a period of 6 years, when the entrepreneur has to build the facilities and fulfill the environmental conditions

stated in both the installation license and the preliminary license, in order to receive the operation license.

Operation License (LO)

The Operation License is issued after the project is finalized and the requirements stated on the previous licenses are fulfilled. It grants the right for the project to start operating. The steps for obtaining the LO are:

LO Application

It occurs when the works are almost complete (80-90%). For this application the entrepreneur should submit final implementation report of the PBA and meeting the conditions of LI. The LO's application must be accompanied by the legal publication of the same application.

Field Survey

The environmental agency does field surveys, which are based on the results of the submitted reports.

Issue of LO

After the issue of LO the entrepreneur must provide the legal publication. The deadline starts counting as soon as the environmental office register the application for the operation license and its period is:

- 6 months for regular process with RCA;

- 12 months for regular process with EIA and RIMA;
- 60 days for simplified processed.

Furthermore, the operation license specifies for how long a facility has permission to operate. This period can vary from four to ten years and, by the end of the license's validity, the entrepreneur must apply for a new license.

Special Licenses

In some cases, when the project involves soil exploitation, there is the need of applying for licenses like the Licensing of the Institute of Culture Heritage (IPHAN). The affected municipalities must provide Compliance Certificate with the Use and Land Use. These documents are attached to the LP requirement and aims to ensure that the project does not harm the Master Plan of the municipalities.

Enterprises in rural areas are mostly complying with the master plans. The steps are similar to the environmental licensing, but instead of being licensed, permissions are issued. The process goes through each Federal State's IPHAN superintendents or directly by the National Center for Archaeology (CNA) linked to IPHAN in Brasília.

The Chico Mendes Institute for Biodiversity (ICMbio) is the Federal Body responsible for issue licenses regarding the projects implemented in Conservation Units (UC). It is important to clarify that there are basically 3 types of areas protected by law:

- Permanent Preservation Area (APP): depend only on your location and are defined in the Forest Code, are the banks of rivers, wetlands, hills, etc.
- Legal Reserve (RL): are areas within rural properties that are defined by their owners. The areas are also ruled by the Forest Code. Although they are provided for by law since 1965, few rural properties have these regulated areas.
- Conservation Units (UC): are areas created by the government through the National System of Conservation Units (SNUC). There are several classes with different degrees of UC use limitations.

In cases of direct or indirect interference (roaming zone) in indigenous lands, there is a need for specific environmental studies considering the indigenous component. The indigenous lands are usually regions of conflict among indigenous people, settlers and owners. The National Indian Foundation (FUNAI) is the licensing authority, however, in practice; entrepreneurs manage dialogue with the tribes. Furthermore, the Palmares Foundation is responsible for managing the life quality of indigenous people specifically from Northeast Brazil.

In power and heat generation projects where there is need for water consumption, it is necessary to obtain the Water Use Grant, which can be provided by the National Water Agency (ANA) or State Departments of Water Resources, depending on whether the source funding is federal or state.

The National Bureau of Mining Production (DNPM) maintains a database of all mining use requirement. You can also find in this database the position of cases, for example if you are in the study phase, the studies have been approved and already have granted. Furthermore, projects located near the airfield or with significant height, must be approved by the Command of the Aerospace Agency (COMAR).

Some power generation projects (hydropower, transmission lines and substations) can receive from the National Energy Agency (ANEEL) the Declaration of Public Utility (DUP). This document is a pre-requisite for removal of vegetation in protection areas and allows judicial foreclosures. There is the necessity to check with ANEEL whether DUP is necessary for CSP plants.

3. RESULTS

The dimensions of the environmental impacts define the type of licensing for power generation projects in Brazil. Projects with small impacts follow the simplified procedure, while projects with large environmental impacts follow the regular procedure. As observed in the case of the CSP plant of Petrolina-PE, environmental licensing of CSP plants should follow the simplified route. However, even the simplified procedure demands a deep understanding of the step-by-step requirements to obtain the licenses. Five proposals for simplifying and improving the simplified licensing process for CSP projects are given by the authors:

Communication process

In order to tackle information gaps regarding CSP technologies and its environmental impacts, the GIZ and the Ministry of the Environment invited stakeholders involved in the licensing process of CSP plants in Brazil, Germany and Spain, to participate in a Workshop held in November 2014 in Brasília. The environmental agencies had the opportunity to interact with experts and discuss about commercial CSP facilities. Building up a network for key decision-makers and opinion leaders gave the foundation for dissemination of knowledge on CSP and could enable that knowledge to be put into practice in the institutions involved. This meeting brought experts a better understanding of the Brazilian regional context. The semi-arid regions in Northeast Brazil have social and environmental peculiarities which should be taken into consideration before starting a CSP project. Therefore, the positive and negative impacts of this technology should be presented and depicted in detail. It is highly recommended capacity building of experts who could issue the licenses for CSP projects locally.

Development of a CONAMA resolution for CSP plants

The Environmental Impact Assessment (EIA) and the Environmental Impact Report (RIMA) are the most complex studies that can support a process of obtaining prior permission. They evaluate all the consequences of a project for the environment. EIA and RIMA became mandatory and complementary with the entry into force of the CONAMA resolution number 0001/86 which

requires the preparation of these studies for the implementation of highways, ports, airports, pipelines, transmission lines, exploitation of water resources, landfills, power plants and others.

For projects that do not produce any significant environmental impact, the Environmental Control Report (RCA) can be used, which is a simpler report, compared to the two previous reports.

In 2001, CONAMA created, through the resolution number 279/01, the Simplified Environmental Report (RAS). This report has the objective of creating a simplified licensing procedure for low environmental impact activities that increases the energy offer for the Brazilian energy system; it aims specially the wind power plants and other renewable energy power plants.

As discussed before, the CONAMA resolution number 462/14 was created to set the guidelines for wind power plants environmental licensing. It also states in which cases these power plants should not use the simplified procedures, which are:

- I. Dunes formations, fluvial plains, mangrove and other waterlogged areas;
- II. Within the Atlantic Rainforest and requires vegetation removal, according to the law number 11428/06;
- III. In coastal areas, according to the law number 7661/88;
- IV. Within 3 kilometers of an environmental protected area;
- V. Areas used by migratory birds for feeding, resting or reproduction;
- VI. Areas that may cause social or cultural impact to a community;
- VII. Areas where endangered species are found.

Since specific requirements were created, this resolution facilitated the licensing process of wind power projects. As a consequence, since 2001 there is an increase in investments in this sector. The construction of several wind parks in Brazil could gradually contribute to a sustainable mix in the Brazilian energy matrix. Therefore is highly recommended the creation of a specific clausal inside the CONAMA Resolution for CSP. Legislation needed to promote CSP technologies should be developed in cooperation with institutions in the energy sector involved in various aspects of regulation, such as the Energy Planning Agency (EPE), the Regulatory agency (ANEEL), the Environment Ministry (MMA) and the Industry Ministry (MDIC). The focus includes energy planning methods that integrate CSP, energy auctions, technical regulation, environmental licensing and taxation of imported plant components.

Standardization of the process

For the construction of CSP plants, the entrepreneur should be dismissed to go through the regular procedure and present EIA and RIMA. It should be followed the simplified route, therefore presenting the following:

- RAS (Simplified Environmental Report)
- RCA (Environmental Control Report);
- PCA (Environmental Control Plan);
- PRAD (Degraded Areas Recovery Plan).

These documents address the needs of projects which cause low environmental impacts and do not require as dense and detailed work as the EIA and RIMA.

Small to medium size projects

The Simplified License (LS in Northeast and RAS in São Paulo State) should be granted to the location, installation, deployment and operation of projects and activities that, in the licensing opportunity, could be accommodated in small and medium pollution potential and in micro or small degrading category. In some cases, there is the possibility to get the “Free-of-License” (Dispensa de Licença). This kind of document can be issued when the project is a pilot venture involving research institutes, small to medium enterprises and universities. This license can be only issued by the Federal State Environmental Agencies.

Capacity building

The introduction of CSP technologies in Brazil should happen in a horizontal way. All sectors of the society should be aware of the benefits and the environmental risks of this technology. Especially, the licensing agencies should be invited by the government, the universities and research institutes to participate in seminars and workshops regarding the use of CSP. Training and awareness should facilitate the communication process with entrepreneurs. The

Brazilian government should work together with the academy, the private sector and the environmental policy makers and agencies to develop and demonstrate technologies that can be fit to the market conditions and the environmental standards.

4. DISCUSSION

The introduction of CSP technologies in Brazil has just begun. In the long run, it has the potential to bring economic progress to the poorest regions of the country, the Northeast, where the most solar radiation occurs. Therefore, informing the population about the advantages of this technology is crucial to establish the basis for acceptance and convincement. Knowledge dissemination should be done through training and capacity building of CSP experts. This strategy should be included in the government's R&D agenda.

Legislation needed to promote CSP technologies should be developed in cooperation with institutions in the energy sector involved in various aspects of regulation, such as the Energy Planning Agency (EPE), the Regulatory agency (ANEEL), the Environment Ministry (MMA) and the Industry Ministry (MDIC). The focus includes energy planning methods that integrate CSP, energy auctions, technical regulation, environmental licensing and taxation of imported plant components.

Concerning specifically the environmental licensing of CSP projects, it has been recognized that the current procedures for obtaining the licenses need to

be renewed, standardized and disseminated. The initial problem lies in the absence of specifically tailored licensing procedures for CSP. Furthermore, there is a lack of local specialists able to analyze projects in Northeast Brazil. In most of the cases, the environmental agencies analyses CSP projects based on environmental criteria applicable for conventional thermal power stations. The misunderstanding regarding the technology hinders the licensing process.

Revenues from CSP projects are needed to encourage private sector investment and provide a stable investment climate. Nevertheless, CSP project developers and investors still face market-based and regulatory barriers preventing their technology from being integrated in the national energy matrix. This challenge can be overcome through the implementation of feed-in tariffs, production of tax credits, public benefit charges specific to CSP and a less bureaucratic environmental licensing process. Furthermore, the Brazilian Ministries must work together with the State Agencies and those must work with the Municipal Agencies to address these market and regulatory barriers with a comprehensive and long-term approach. Such initiatives shall be implemented before the CSP technology becomes available in the Brazilian market.

5. CONCLUSIONS

This paper analyzed the legislative requirements for a successful approval for the construction and operation of CSP plants in Brazil. Despite of the great potential of CSP, the technological and environmental aspects are relatively unknown by the Brazilian environmental agencies. This makes the environmental licensing process becoming more complex and time consuming.

Nevertheless, the complexity of the licensing procedure is determined by the extent of the environmental impacts generated by the facility. Since CSP plants have been shown to have low environmental impacts, the licensing procedures should be facilitated. Brazil's policy makers should be determined to introduce innovation policies to promote socially, economically and environmentally sustainable growth. When applying a transparent and low-cost policy reform, one can support entrepreneurs to reduce costs, create jobs and drive economic growth.

ACKNOWLEDGEMENTS

This paper is part of the final results related to the i-NoPa/CIESA project, titled "Studies of heliothermic (solar thermal) energy (CSP – Concentrated Solar Power): consortium for educational integration and sustainability of agro-industry". The i-NoPa/CEISA project is an initiative of academic cooperation between Brazil and Germany and the partnership involves the following institutions: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior

(CAPES); Deutscher Akademischer Austausch Dienst (DAAD) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The authors would like to thank the mentioned institutions for their support.

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