

PHOTOVOLTAIC RURAL ELECTRIFICATION IN THE AMAZON AND THE NATIONAL METROLOGICAL BARRIERS

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Abstract:

The aim of this study is to present the insertion occurred of the photovoltaic generation technology with the purpose of providing electricity in the Amazon region, the views and considerations regarding the disturbing worldwide adaptation in national metrologic compatibility , for systems and equipments photovoltaics .

Introduction:

The Brazilian energy supply is guaranteed to generation mostly from large hydraulic developments, guaranteeing the supply of consumer centers. The Amazon region presents particular obstacles in the diffusion of expansion of power systems , because of population dispersion, low economic attractiveness for the purpose of productive use of energy, logistical difficulties to environmental vulnerability and the international pressure over the region. Since only the state of Amazon, is expected to approximate 4,000 communities must be on the fringes of electrification due to be located in areas of difficult access.

The resource of the use of electricity in the entire country is provided by the government as a driving force to combat social inequalities and ensuring the development of generation resources, yet guarantee of fixing populations in rural areas with the availability of comfort and relaxation provided by the use of electricity.

Over the years, with the diffusion of photovoltaic technology in countries with strong technological development, strove to take advantage of recent technology that has enormous advantages over the traditional generation based on the use of diesel, such as technical feasibility to provide energy to remote places in Amazon region, less care and supervision in the operation of installed systems. With the technological resource available some electrification programs occurred in order to initiate a demand for electrical exclusion, unknown to the government.

The programs in the Amazon region and nationwide, generating knowledge that identified gaps and difficulties in the course of electrification in areas with high rates of electrical exclusion by providing subsidies for energy planning for the region and developing appropriate legislation to the diversity of the region.

Renewable Energy Programs

The observance with new technologies for electrification amounted in Brazil as an alternative to overcome deficits in the availability of generation in complex regions. Apart from the consideration for the ability to supply energy, made possible because of the diversity of energy sources, note the expansion of generation based on natural resources, available in abundance, providing energetic security and compliance with environmental care, so evidenced in global character. The government proposal was to implement several pilot programs of electrification, in order to signal the deployment in greater representation. The projects subsidize information that allow to be made remarks model of energy supply sized and installed, and which also provided information to quantize certain causes of failure in electrical systems directed to the region.

Programa de Desenvolvimento de Estados e Municípios - PRODEEM

Established in 1994 and led by the Ministry of Mines and Energy (MME) the program aimed to serve isolated communities in need, unmet by conventional grid electricity, using renewable sources in local self-sustainable basis, to promote social development and economic development of unassisted rural communities. Being that the photovoltaic generation was the main resource used to bring electricity to rural communities using.

The program installed nearly 9,000 photovoltaic power generation and water pumping, and invested \$ 37.25 million. In 2002 PRODEEM activities were suspended and the program was incorporated to the program Luz para Todos (Light for All).

Programa Luz no Campo

Established by the Decree of 02/12/1999, with coordination by ELETROBRAS, using resources from RGR. The goal of the program, according to official data, was to electrify one million farms until 2002, being planned the generation from renewable sources.

The attendances were made possible with mains extension, being propitious the adoption of renewable sources in the attendance to the isolated systems, and technically unable to the expansion of the conventional system of power distribution. According to data released by Eletrobrás, until January 2004, about 570,000 families were benefited from the Luz no Campo.

Projeto Ribeirinhos

It was developed as part of the Luz no Campo in order to deploy in riverside towns of the Amazon region systems based in alternative sources for power generation with use of energetic resources. Projeto Ribeirinhos installed photovoltaic systems in approximately 170 individual households.

Projeto Xapuri

Began in 2005, from the establishment of partnership between Eletrobrás with the German organization for technical cooperation GTZ. The project was scaled to 103 photovoltaic systems in the rubber plantations Iracema, Two Brothers and Albrácea, with a population of 37, 35 and 31 households respectively, in the municipality of Xapuri - AC, in the settings DC, CA and mixed (DC-CA). The research aims to implement alternative, more efficient systems of intermittent generation photovoltaics. Therefore, part of the SHS were implemented with call option in direct current (DC). It is currently being monitored.

Programa Luz para Todos

Established with the Law No. 10.438/2002, created with the objective of reducing poverty and hunger by using energy as a vector of development, focusing on care in rural areas to small consumers. The initial estimate was to make 2 million new connections, and this revised to 2.9 million connections by 2010 being that the program was extended until December 2011, for purposes of accounting closing and completion of physical.

The total funds earmarked for the program, adds 20 billion dollars, of which \$ 14 billion are federally insured and the difference is supplemented resources between state governments and utilities. The Luz para Todos provides assistance to people located in distant, isolated and difficult to access and were not confined only to the conventional route network extension, making room for renewables and alternatives sources.

Projects covered under the Ministerial Decree No. 60/2009, and benefit from resources of the program of universalization Luz para Todos.

Project 12 little mills Photovoltaic

Designed in setting photovoltaic little mills associated with little networks of power distribution, in low voltage. The project covered 12 rural communities in the state of Amazonas, in six counties, providing 220 new links.

Projeto Araras

Developed in technical cooperation between Eletrobras CHALK and Celpa for implantation in the State of Pará. The system was designed on three associated systems with little network, being one a solar-diesel hybrid, eolian and the other two are configured on photovoltaic generation. 75 visits are planned.

Project Sucuriju

The power generation design integrates Diesel generation with two types of renewable energy sources: wind power (wind) and the complementation of photovoltaics, for service to 90 households in State of Amapá.

The study was conducted by the Federal Universities of Paraíba, Pernambuco and Pará, in partnership with the state government, with resources of approximately 2.3 million dollars from the Ministry of Mines and Energy (MME).

Projeto Vila campinas

This location is served by a hybrid system (Photovoltaic-diesel) of electricity generation installed in 1997 through a partnership between Brazil/USA. The project consisted of supplementary generation, previously merely Diesel, with a photovoltaic solar plant, with sizing to supply 140 homes.

Programa Metrológico Brasileiro - Technical Barriers

The development of the Brazilian program for the conformity evaluation for equipment and photovoltaic systems was created in Brazil to complement the evaluation program for consumer electronics, established by decree No. 396 of 2008, the same grounded on the national policy of conservation energy and technical regulations that sought to identify equipment with better functionality and security.

This requirement was established initially on a voluntary basis, in other words, where the manufacturer is not required to meet the guidelines specified in the regulation of the Brazilian labeling program.

Looking to provide greater safety for users of photovoltaic systems and also standardize the Brazilian system of photovoltaic generation, it was instituted the ordinance 004 of 2011, that establishes a term limit for entry into Brazil of photovoltaic systems, and, after the expiry will be accepted only product certified by the Brazilian system of evaluation of conformity - SBAC. The deadlines are:

-Manufacture or import: July 1, 2011.

-Marketing to retailers: December 1 d E2011.

-Marketing to the final consumer: July 1, 2013.

So the knowledge about the establishment of the Brazilian program of conformity evaluation for photovoltaic systems and equipment is of great importance for the continuation of electrification through this renewable resource.

Incentive Policy

Regime Especial de Incentivos para o Desenvolvimento da Infra-Estrutura - REIDI; The adherence to REIDI suspend the requirement of the Contribution to PIS/PASEP and COFINS on purchases and imports of goods and services related to approved infrastructure project in the period of five years from the date of its adoption.

Article 2 is benefiting of Reidi the entity that has the project approved for implementation of works of infrastructure in transportation, ports, energy, sanitation and irrigation.

Universalization

Law 10,438 of April 2002, provides for the universalization of public service of electric energy.

Decree 4873 of November 2003, introduce the National Program for Universal Access and Energy use, which additional to the goal of expanding the service, creates the decree No. 60 of February 2009, which promotes electrification under the program Luz para Todos, with the use of renewable resources, and among them electrification with photovoltaic systems. This being the system with technology better known.

The LPT program tries to drive the generation of decentralized renewable with the approval of his new guide of special project 7, from Ordinance No. 60 of February 12, 2009. The program spends to subsidize 85% of direct costs of deploying little networks supplied by renewable sources, with the remaining 15% as consideration for executing agents.

Programa de Incentivo às Fontes Alternativas de Energia Elétrica (Proinfa)

It was established by Law No. 10,438 of April 26, 2002, created the Programa de Incentivo às Fontes Alternativas de Energia Elétrica (Proinfa) with the aim of increasing the participation of the electricity produced by projects conceived fundamentally on wind power, Biomass and small hydropower (SHP) in the National Interconnected System (SIN). The very Law 10.438/02 is a device that regulates the use of resources from the Global Reversion Reserve (RGR) for a program to promote this technology (Art. 23 II).

The aim is to promote the diversification of the energetic Brazilian matrix, seeking alternatives to enhance security of supply of electricity, and allows for recovery of the characteristics and potentials regional and local. Expected benefits: Social, Technologic, Strategic, Environmental, Economic.

Resources

Over the years, the federal government has allocated resources to promote the implementation of projects lined in renewable energy use.

Subrogation CCC

The sector fund CCC (Fuel Consumption Account) established in the 70s with the purpose of repaying part of the total cost of generation to supply the public service of electricity in Isolated Systems. By means of Law No. 12.111/2009, this fund is expected to be promulgated without closure forecast. The fund also allows, when there is a reduction of expenditure on CCC by replacing thermal power that uses oil derivatives in isolated systems, the refund of up to 75 percent of the investment value of the basic design approved by the regulatory agency - ANEEL.

Decree No. 7240/10

Regulating Law No. 12.111/2010 which provides to the electric service of Isolated Systems, which offers to the electricity services in isolated systems and the use of resources of the Fuel Consumption Account - CCC, which shall consider the costs directly associated with the provision of service of electric energy in remote regions of the Isolated Systems, characterized by the wide dispersion of consumers and lack of economies of scale.

Bus companies, licensees and permittees shall foresee mechanisms to induce energy efficiency, economic to value the environment and the use of local energy resources, to achieve the economic sustainability of power generation in isolated systems, in areas under its concession.

Redd

The current global policy of providing incentives for reducing emissions from deforestation, forest degradation, increase forest reserves of carbon, sustainable forest management, forest conservation and points to the availability of resources in development projects that impact on climate overall. Associated with these factors is the need for removal of the forest for the implementation of electrification projects. Are also included investments that resulted from the implementation of projects based on the neutralization of emissions of greenhouse gases through sustainable solutions, with a system for obtaining the sale of credits associated with the reduction of greenhouse gases.

Actually, in the Amazon state, that has 1,497 millions km² of conserved forest and by the Sustainable Amazon Foundation that developed the Forest Pack Program, that is the biggest project of compensation of environmental services. This institution also develop the only project of REDD today in execution in the Amazon and the one of the few in Brazil, in the Juma's Sustainable Development Reserve, with the purpose of hold the deforestation and its respective greenhouse gases emission in an area of subjected to big pressure of soil use in the Amazon state. The project will be active until 2050, until when is expected produce about 189.767.027 tons of CO₂ credits.

The philosophy of keeping the forest intact, developing programs of education, health, finance generation to promote the reduction of the deforestation in the area of environmental conservation of Amazon state

and obtain the significant improving of the quality of life of the population that lives in the forest, securing the contribution to the planet's climate and biodiversity guarantee reservation.

Climate Fund

The National Bank of Economic and Social Development and the Ministry of Environment operate lines of credit from the National Fund on Climate Change, to benefit projects for low-carbon economy in the country. The Climate Fund also has special credit lines for the energy sector with the use of solid waste in 12 capitals which will host World Cup games in 2014, and its metropolitan areas. The loans have five-year grace and 15 years for repayment.

RGR

It was instituted by Law No. 5655 of May 20, 1971, is a incumbency of the Brazilian electrical sector paid monthly by the oil companies for generation, transmission and distribution of electricity, with the purpose of providing resources to reverse and / or expropriation, of public power service.

The Provisional Measure 517 9.648/1998 amended the Law to extend the validity of RGR until the end of fiscal year 2035. Are computed cost of service of utilities' annual dues reversal, appeals for reversal, takeover, expansion and improvement of public power. Resources may be:

- Employed by licensees, cooperative, inter-municipal partnerships.
- Destined for production facilities from renewable sources;
- For the deployment of up to 5 MW power generation units, intended solely for the public service in populational communities of the isolated system.

CDE

Established in April 26, 2002, the CDE has a duration of 25 years and is managed by Eletrobras and to promote the development of energy states, projects of universal services of electricity, the subsidy program for low-income consumers and the expansion of natural gas network to meet the states that do not have piped network. The CDE is also used to ensure the competitiveness of energy produced from alternative sources (wind, small hydro and biomass) and the national mineral coal.

The resources required to run the CDE are from (i) fines imposed by ANEEL (ii) annual payments made in respect of use of public good - UBP, and (iii) payment of annual dues by part of all agents that marketing power with the end consumer.

Perspectives

The programs of electrification with renewable developed in the country, indicated the viability as an alternative to solve the supplies to regions in which for reasons of supply, transportation logistics, environmental become unviable their attendance in effect of expansion systems, the use of renewable sources related to the technologies that supply energy and provide the development of populations with availability of energy resource.

The integration of renewable photovoltaics sources is integrant of the plan of care to isolated systems, in 2009 was suspended the bid for the purchase of 27,494 photovoltaic systems for electrification systems at home. It is expected the electrification of remote areas in the Amazon, in response to the plan of universalization, that sets the year 2015 so there is availability of supply of electricity in the national character.

Besides the large demand for electrification in rural areas, where the photovoltaic technology presents with emphasis for its feature of implantation, by the used generating source and minimal operational needs, adds the need to obtain gains in harnessing available energy and diversify sources of energy. Therefore the inclusion of technology use in urban areas, is a factor in consideration to compromise and environmental gains, use of clean technology as a productive resource, and ensuring energy supply. Associated with industrial application of solar photovoltaic technology, It is anticipated the installation of systems connected to the grid, moment when is studied the adequacy of the legislation of the electricity sector, to include the feasibility of harnessing energy that arise.

In the region of western Amazonia, for projects in the state of Amazonas, the Superintendência da Zona Franca de Manaus, offers encouragement for setting up industries in the Amazon region. Among the benefits include exemption from: IPI - Tax on Industrialized Products, II-Tax on imports, IE - Tax on

export ISOF - Tax on financial transactions and program special export allied to the benefits offered by the government of Amazonas State, Prefecture of Manaus, configured with the credit and refund of Tax of movement of goods – ICM, exemption of taxes on services - ISS, availability of area for the installation of the project at low cost and other benefits administered by the Superintendência do Desenvolvimento da Amazônia - SUDAM. Therefore, manufacturers of systems and equipments photovoltaic offer incentives for its attachment, as well as proximity to the promising markets of Brazil and Latin countries. In addition to the Special Incentive Program for the Development of Infrastructure.

The policy of conservation of energy drawn by the Brazilian government states that with the consolidation of its plan the availability of energy supply arising due to the reduction in consumption, coupled with the use of efficient equipment for both the establishment of equipment with better technology and efficiency are highly favorable for facility in the Brazilian market. The sectors and the agency that make up the national electricity sector, are preparing to permanently adjust the legislation that will the systems of photovoltaic solar utilization configured with capacity of supply to remote regions and the availability of energy to the grid connection.

The return on investment in electrification is another factor of considerable attraction, as there are programs for reimbursement through projects of energy generation which does not require the use of fossil fuel as an energy resource, such as government incentives like the subrogation of CCC, projects in isolated regions covered under the Act 12.111, and other projects that use carbon compensation mechanism, which can be redeemed through carbon credits, such as projects based on CDM - Clean Development Mechanism. As the Brazilian market specifically attractive for the dissemination of renewable energy sources, among them solar-photovoltaic given the abundant supply in Brazilian territory.

Conclusions

Brazil has a sizable population without electric supply, even near the end of the government's most relevant program to universalization of the access to electricity, national because of the geographic particularities of the amazon region. The projects developed in the region were of magnanimous importance for the performance's evaluation of the integration of photovoltaic technology as proposed to electrify dispersed populations, located in the Amazon, with observations on their performance.

The Brazilian government remains committed to the electrification in the scattered populations deprived of power public service and plot plans with the utilities to minimize the electrical exclusion, understanding that the electrification arising from renewable sources has differential importance. For that government strategies are plotted to provide the energy supply provided through the regulation of systems configured for different populational groups in the Amazon, in groups or alone.

Financial resources for development of projects of power generation and electrification are abundant in the country, international incentives for the development and use of clean generating sources, in addition to the national interest to diversify energy sources.

Inmetro, agency manager of the Brazilian System of Conformity Assessment - SBAC, orients the Brazilian effort in putting together the Brazilian Conformity Assessment – PBAC, which aims to promote a long term vision for the strategic management of the activity of Conformity Assessment – AC in the country. Conformity Assessment is a powerful tool for industrial development and consumer protection. For regulators, the programs of conformity assessment, including evaluation of the program for photovoltaic systems, represent an important instrument to enforce compliance with regulations set by them and facilitate the supervision they carry out.

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