

# **Distributed Generation in Brazil: Assessing the institutional and market design barriers preventing renewables small-scale generation deployment**

Clarice C. de M. Ferraz  
Bioeconomics Group, Chemistry School/  
Energy Economics Group,  
Inst. of Economics, Fed. Univ. of Rio de Janeiro, Brazil  
Phone: +55 21 3938 5269, e-mail: clarice.ferraz@gmail.com.br

## **Overview**

The Brazilian power sector is going through a severe crisis. There are important problems associated with the marginal costs of electricity generation expansion. While distributed generation resources (DG) could provide an important contribution to mitigate those problems, the Brazilian electricity institutional organization and market design, more than ten years old, were set at a time where the fast increase in the new renewables deployment that we are facing nowadays around the world was not expected.

Only recently in 2012 Brazil has started to regulate mini and micro DG connected to the distribution network. However, little has been done in terms of diffusion of those systems even though, for example, the solar photovoltaic (PV) technology has already achieved tariff parity with respect to the price of electricity charged by the distributors. It was believed that thanks to their advantages (complementarity with hydro generation, urban integration, speed of installation, etc.) the source would experience a rapid growth. However, this was not observed.

If we compare wind power and solar PV expansion dynamics in the Brazilian electricity portfolio we face very distinctive paths. Differently from wind power, which met great success in Brazil, distributed solar PV in mini and micro generation is not having the same success. It is known that it represents a break from the paradigm of centralized generation in Brazil whose consumers are extremely passive. Therefore, to address properly its deployment it is important to think of new ways of setting the Brazilian electricity sector organization, its institutions, its players (and their roles) and its regulation. So far, this has not been done, DG generation diffusion is only happening through large size facilities, like wind and solar farms, preventing the Brazilian electricity sector from all the benefits of small scale generation systems.

Our study identified several policy and regulatory barriers at the origin of this lack of diffusion and discusses solutions to help policymakers to overcome them in order to develop a market framework where renewables could be accepted together with the other traditional market sources of energy generation. By having this market conditions framed and well positioned we could at the technical level absorb high level of renewables into our system without any issue that would affect the system well functioning.

## **Methods**

In order to address the major barriers to micro and mini DG deployment in Brazil, we realize an extended literature review on the issues regarding small DG renewable generation among several countries. We take stock of what have been the successfully done, and how the well-succeeded experiences did match the environment where they were adopted. After learning from these international experiences, employing the framework of Transactions Costs Theory, we investigate the institutional problems the sector is facing to help design adequate policies to match Brazilian electricity sector specificities.

## **Results**

We analyse the evolution of the institutional framework regulating small DG generation and find out that while regulatory framework has evolved to embrace the advent of the small consumers generation their own electricity, the main aspects of the electricity policy did not follow. The funding and

financing schemes continue to be thought for a sector with centralized dispatch and predominant large-scale generation facilities.

The present paper shows important results. In almost all regions we found that there is grid parity between the distributed micro PV generation and the price of electricity charged from the local utilities. Since we did not find major technical or economical barriers, we focused our analyses on the institutional barriers that are preventing its deployment. It turns out that the electricity sector has been experiencing important regulatory changes that altogether bring instability and increase the risk related to the investment in the new technology.

### **Conclusions**

The present study reveals the major barriers preventing DG systems to attend its full potential, predominantly in small scale facilities, in Brazil. In order to overcome those obstacles and accelerate its pace of diffusion, taking profit from its natural resources advantages and the associated energy efficiency gains typically associated with the small DG systems adoption, policymakers must design an institutional framework where these systems can coexist with the traditional large scale plants.

With adequate institutional framework, were renewables could be accepted together with the other traditional market sources of energy generation, the small DG renewable generation should experience an important growth. More DG would help to stabilize the electricity system; reduce impacts of residential peak consumption; reduce the losses associated with electricity transport; besides postponing investments in the grid and increasing its security of supply through the adoption of new renewable generation.

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