

CHALLENGES OF INSERTING THE DISTRIBUTED GENERATION IN THE CONTEXT OF ENERGY TRANSITION

Olivia Del-Puppo, University of São Paulo, +55 83 99905-5572, delpuppo@usp.br
Edlayan Passos, University of São Paulo, +55 71, 99389-2808, edlayan@usp.br
Virginia Parente, University of São Paulo, +55 11 99972-8711, vparente@iee.usp.br

Overview

Aiming at reducing greenhouse gas emissions from the electricity mix, a significant part of countries around the world has been undergoing a wave of investments in so-called renewable energy sources. Part of this new electricity generation has occurred through distributed generation connected to distribution networks [1]. Customers, formerly consumers, also become electricity producers, or prosumers. The change in the profile of customers creates a new challenge for distributors who need to equalize their costs, maintaining security, system reliability, and remuneration for services provided, even in the face of a shrinking number of exclusively consumer customers [2]. The change in the profile of customers, from just consumers to prosumers, has numerous implications. The energy transition underway is based on the three Ds of decarbonization, decentralization and digitalization of energy, which together form the three fundamental pillars for a path to a sustainable development of the electricity supply around the world. While most other countries are struggling to stop generating energy from coal or oil derivatives, Brazil, which already has a broadly decarbonized electricity mix – with practically 85% of its domestic supply coming from renewable sources, due to its large availability of hydropower which accounts for 65.2% of total electricity supply – has the focus of its transition in the aspects of decentralization and digitalization [3]. However, regardless of the emphasis on one or two of the three Ds of the energy transition is given by a country, or what its medium and long-term goals are, the strong insertion of sources such as wind and photovoltaics, mainly through distributed generation connected to the grid, shows a series of problems involving distribution concessionaires [4]. In this context, this article aims to analyze such challenges, in a Brazilian electricity sector that is already quite decarbonized, in which the other two “Ds” – digitization and decentralization – are the biggest challenges.

Methods

This article starts from a survey of the situation of electricity generation in Brazil. The evolution of the Brazilian electricity generation mix is put into perspective regarding the changes observed in the last ten years, and also prospective, that is, what are the new changes expected for the next ten years [3]. Next, the challenges imposed on distributors operating in the country are analyzed, comparing them with those challenges that are being faced by countries in which distributed generation is already more inserted. Finally, the mapping of energy policy conduction needs is presented with suggestions for countries that, like Brazil, have their challenges with an emphasis on decentralization and digitalization aspects, seeking a regulatory conduction that is fair with the services of the distribution segment in this new context.

Results

International experience shows that the improvement of the legal and regulatory framework is the main part for the continuity and maintenance of energy distribution concessionaires, in this context of strong decentralization resulting from the growth of distributed generation. At the same time, it is observed that it is necessary to safeguard the profitability of distribution concessionaires in this new context, since the fastest growing distributed generation needs network connectivity. The results indicate that the most crucial aspects to continue the safe and reliable growth of distributed generation in Brazil are closely related to the provision of a legal-regulatory context that legally supports distributors in this transition period. Furthermore, the need to digitize the grid, with the use of smart grids, is well regarded by the national and international energy sector and is fundamental for the optimal development of distributed generation with distributors.

Conclusions

Analyzing the situation of the Brazilian energy transition and contrasting it with the transition of more developed regions, it is clear that, unlike other countries, Brazil already has a decarbonized energy matrix. In this way, Brazilian efforts must be focused on the decentralization of energy generation and the digitalization of the sectors that encompass the electricity supply. To achieve this goal, the use of digital technologies, such as smart grids, associated with a remodeling of the regulatory framework, has proved, in the international context, to be beneficial to equalize costs and provide reliability for both energy distributors and distributed generation providers. Thus, there are lessons to be learned by countries that, such as Brazil, need to providing resources to improving its legal-regulatory framework and increase investments in the digitalization of the sector with a greater insertion of smart grids.

References

- [1] HIRSCH, A.; PARAG, Y.; GUERRERO, J. Microgrids: A review of technologies, key drivers, and outstanding issues. **Renewable and Sustainable Energy Reviews**. Elsevier Ltd. Abril, 2018.
- [2] POLLITT, G. M. Electricity Network Charging in the Presence of Distributed Energy Resources: Principles, Problems and Solutions. **Economics of Energy & Environmental Policy**, Vol. 7, No. 1. 2018.
- [3] EPE, Empresa de Pesquisa Energética (Brazil). **Balanco Energético Nacional 2021: Year base 2020** / Empresa de Pesquisa Energética. – Rio de Janeiro : EPE, 2021.
- [4] UNEL, B. *et al.* Energy Transition, Distributed Energy Resources, and the Need for Information. **IAEE Energy Forum**, 2020.