# Energy Systems of the Future in Brazil

## Improving the conditions to integrate renewable energy and energy efficiency in the Brazilian energy system

## The challenge

Per capita electricity consumption in Brazil is projected to increase by 18% between 2019 and 2029. By 2025, a substantial share of this demand will be met by renewable sources, with roughly 45% generated by hydroelectric power and about 40% from other renewables, such as wind, solar, and distributed generation.

This strong reliance on hydropower, however, also brings vulnerabilities. Longer and more frequent droughts, driven by climate change, threaten supply security and highlight the need for diversification.

To address these risks, Brazil has been expanding non-hydro renewable sources, particularly solar and wind, while also promoting energy efficiency across key sectors of the economy. These measures aim to reduce dependence on fossil fuels and build a more resilient electricity system.

Solar and wind generation are expected to grow rapidly in the coming years, but achieving this potential will depend on advances in sector planning, operation, and regulation. Logistical challenges, such as ensuring reliable distribution and meeting demand in high-consumption areas, also need to be overcome.

Brazil's electricity matrix is therefore undergoing a profound transformation, moving toward a system that is more sustainable, diversified, and resilient.

## Objective

The conditions for integrating renewable energies and energy efficiency into the Brazilian energy system are improved.

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| **Name of the project** | Energy Systems of the Future (Phase III) |
| **Commissioned by** | German Federal Ministry for Economic Cooperation and Development (BMZ) |
| **Country** | Brazil |
| **Political partner** | Ministry of Mines and Energy (MME) |
| **Duration** | 2021 - 2025 |
| **Orçamento** | € 9.700.000 |

## Our approach

To capitalize on Brazil's huge potential for renewable energies and for savings through energy efficiency, institutions and policy-makers need access to reliable information and data. GIZ provides advice to ministries and other public institutions, as well as other relevant actors, on strategy development and support for developing management and cooperation structures.

The project offers techinical expertise on energy planning and systems management, regulation, development of new business models and dissemination of innovative renewable energy and energy efficiency technologies. By doing this, the project promotes cooperation between actors in the public and private energy sectors, thus facilitating amd sharing technologies and specific know-how.



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## Impacts

The Energy Systems of the Future Project has played a key role in modernizing the Brazil's electricity sector. In partnership with the Ministry of Mines and Energy (MME), and in close collaboration with its implementing partners – the National Electric Energy Agency (ANEEL), the Energy Research Company (EPE) and the National Electric System Operator (ONS) - the project promotes the expansion of renewable sources and advances energy efficiency, making the energy transition more accessible and inclusive. Its outcomes follow the increased participation of renewable energies in the electricity system, while its initiatives address regulatory and planning challenges across generation, transmission and distribution. The project also contributes directly to reducing greenhouse gas emissions, in line with Brazil's Nationally Determined Contribution (NDC) targets.

Together with its partners, the project strengthens energy planning through technical studies, resulting in more than 40 publications. In collaboration with EPE, several studies have been incorporated into government energy plans and now serve as references for further analysis of power generation and distribution. The project has also developed technical materials on key topics, including the energy transition in isolated systems (SISOL) in the Amazon region, the inclusion of Distributed Energy Resources (DER) in planning, and the assessment of climate change impacts on the Brazilian electricity system. Additionally, in partnership with ONS, the project supports improvements in system operation to accommodate the renewables expansion.

To meet the regulatory challenges, the project works with ANEEL to update fundamental standards and normative, producing more than 10 regulatory proposals and foundational studies developed with international expertise and in-depth technical analysis.

Pilot projects, carried out with public institutions, the private sector and civil society organizations, test the feasibility of new technologies and business models while fostering knowledge exchange to implement innovative solutions.

To date, the project has supported the creation of 28 cooperatives based on distributed generation business models, totaling 60 MW installed across 18 states.

Backed by a dissemination strategy, the project also promotes the expansion of energy efficiency learning networks, with five already established and a national government program currently under development based on this methodology.

Gender equity and diversity initiatives are on the agenda for all political and implementing partners. The project focuses on promoting visibility and encouraging the participation of women and vulnerable groups. By providing data, training and studies, it has achieved important results, including the creation of two women's networks in the solar and biogas sectors, bringing together more than 700 women through groups, events and collective mentoring.

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