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BRAZIL'S ENERGY INNOVATION LANDSCAPE

Overview

Home to the world's sixth largest population¹ and twelfth largest GDP,² Brazil is also the sixth largest source of greenhouse gas emissions.³ As of 2021, renewable energy generated nearly 80% of Brazil's electricity.⁴ Large hydroelectric projects dominate, accounting for nearly 55% of all generation.⁵ This reliance on hydropower has left Brazil vulnerable to drought. In 2021–2022, a severe drought caused reservoirs to drop to their lowest levels in nearly a century.⁶ The country is currently diversifying toward other renewable energy sources and natural-gas-fired power plants.⁷ Brazil's National Electrical Energy Agency (ANEEL) expects to add 10.3 GW of installed capacity in 2023, with wind and solar representing more than 90% of new projects.

Foreign Investment

Brazil receives significant foreign investment, including in its energy sector. In the first half of 2022, Brazil received more foreign direct investment (FDI) than all but two countries, the U.S. and China.⁸ As of 2021, the leading sources for Brazil's FDI were the U.S., the Netherlands, and Luxembourg.⁹ In the same year, the electricity and gas sectors accounted for 12% of Brazil's FDI.¹⁰

China is also an important player in Brazil. In 2021, Brazil was the leading recipient of Chinese investments globally, garnering 13.6% of all investments. That year, Chinese companies invested US\$5.9 billion in 28 projects in Brazil, the second highest ever recorded in the country. The electricity sector accounted for 46% of all projects, more than any other sector. In terms of project value, oil represented 85% of total investments. Between 2007 and 2021, the electricity sector received 40.5% of Chinese investments, while oil extraction accounted for 30.9%.¹¹

New Administration

With the inauguration of a new president, Luiz Inácio Lula da Silva, Brazil's climate and energy policies are currently in flux. The administration is creating new units and departments in various ministries, and plans to add a new climate secretariat to every ministry. Many reforms will likely be announced throughout 2023. While much is still unknown, several changes related to energy and climate policy are already clear. Lula has appointed Marina Silva as Minister of the Environment and Climate Change. Silva, in turn, has announced the creation of a National Authority for Climate Security, tasked with the implementation of Brazil's climate policy.¹² Lula has also created a Sub-secretariat of Science and Technology for the Amazon within the Ministry of Science, Technology, and Innovation.¹³

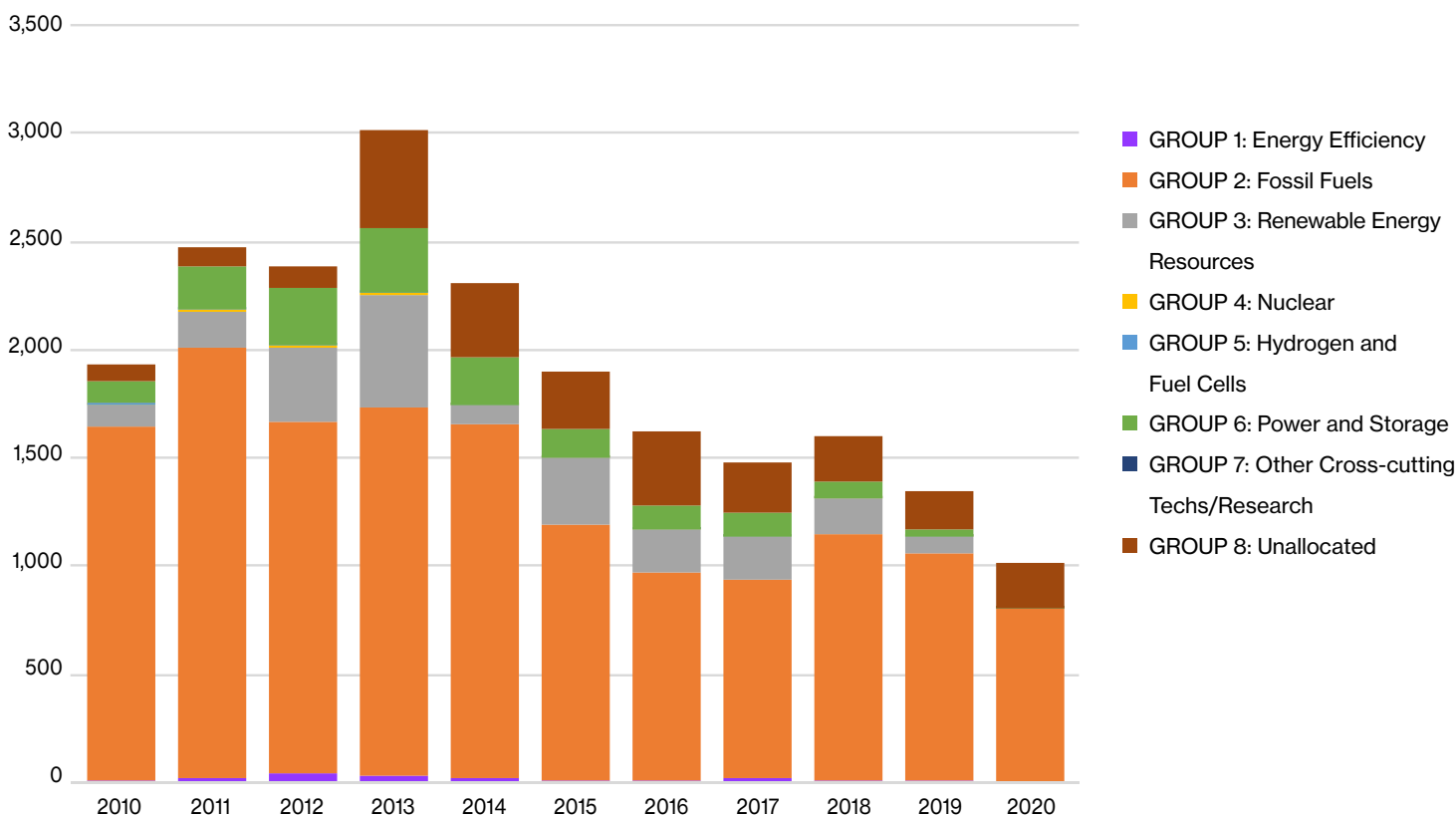
Significant debate surrounds Brazil's fuel prices and the state-owned oil company Petrobras. In 2022, Brazil's previous president, Jair Bolsonaro, waived federal fuel taxes. The Lula administration opted to maintain the waiver for diesel and biodiesel until December 2023.¹⁴ However, on February 27th the administration announced it will resume tax collection for gasoline and ethanol.¹⁵ As for Petrobras, Bolsonaro had decreased state intervention and the company had begun to divest from less profitable assets, such as refineries. In contrast, the Lula administration is expected to increase state intervention and promote clean energy sources.¹⁶ On March 1st, the Ministry of Mining and Energy asked Petrobras to suspend all asset sales for 90 days while the ministry reevaluates its national energy policy.¹⁷ On March 2nd, the new Petrobras CEO Jean Paul Prates held his first major call with investors. While confirming the

company will “maintain [its] leading role in oil and gas production,” he added that up to 20–25% of new investments could shift toward cleaner energy technologies.¹⁸

Energy Innovation Landscape

Public investment in Brazil's clean energy R&D began to decline in 2014. This was ascribed to political tensions, which started in 2013 with a wave of protests around poor public services.¹⁹ Since then, R&D has steadily decreased (see Figure 1). In Brazil, there are three main sectoral funds for clean energy R&D, which focus on: (1) energy efficiency, new alternative energy generation and promoting national technological capabilities; (2) hydrogen and fuel-cell technology; and (3) the production chain of the oil and gas industry.²⁰ The state-owned

Figure 1: Brazil's public expenditures in energy R&D (government and SOE) (in million USD 2021 purchasing-power-parity).



Source: Myslikova, Z., Gallagher, K. S., Zhang, F., Narassimhan, E., & Oh S. (2023). “Global Public Energy RD&D Expenditures Database.” Climate Policy Lab, The Fletcher School, Tufts University. <https://www.climatepolicylab.org/rddmap>. Accessed April 2023; and data on SOEs from regional reports.

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energy companies Petrobras and Eletrobras invest in R&D as well. While the state currently owns 51% of the shares of Petrobras, Eletrobras was privatized in June of 2022, with the state expected to retain 42% of the company's shares.

Brazil does not have a systemic clean energy innovation plan. Major systemic policy initiatives (Innova Energy Program in 2012, National Program of Knowledge platforms in 2014) were discontinued or never implemented. The Law of Good (2005) provides fiscal incentives to firms to conduct R&D, and since 1998 all companies in the power sector (electricity, oil, and gas) have been legally obliged to invest 0.5% of their annual revenues in R&D. However, to date, this requirement does not apply to companies with renewable energy technology

portfolios. Most of the companies under this regulation outsource R&D to universities, with few commercially viable results.

Brazil's federal government has two new 'flagship' policies that have R&D as a pillar: the Fuel of the Future program,²¹ in force since 2021, and the National Hydrogen program (PNH2) established in 2022. The Fuel of the Future program aims to expand the use of sustainable fuels and development of fuel technologies for land, water, and air transportation. It proposes the development of national vehicle technology, as well as a legal and regulatory framework for CCS in the production of biofuels and blue hydrogen. The National Hydrogen program aims to develop a competitive hydrogen market and incentivize national technological development. •

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