GOVERNANCE FOR THE TRANSITION TO A SUSTAINABLE ENERGY SECTOR IN BRAZIL: INTEGRATING ENERGY AND CLIMATE CHANGE POLICIES

Dr Maria Bernadete Sarmiento Gutierrez,
Institute for Applied Economic Research-IPEA, RJ, Brazil
Phone: 55 21 35358507
Email: maria-bernadete.gutierrez@ipea.gov.br

Overview

This research will try to analyse Brazil´s energy policy in the specific perspective of a transition to a sustainable low carbon economy, focusing on the energy sector. The Brazilian energy sector can be characterized following a liberal approach, having suffered major reforms, largely inspired by the UK model. In the context of the Consensus of Washington in the 1990s, a major privatisation process was designed to introduce market forces in the energy sector. The lack of a governance with coordinating and planning capacities led to a series of severe blackouts in the country in the period 2000-2002. In 2004, a second generation of reforms was implemented and an auctions-based system emerged at the core of the regulatory framework that Brazil has since adopted. Yet, the institutional framework was not designed to integrate energy and climate change policies. In fact, there has been a worsening of the Brazilian energy matrix in environmental terms, with an increase in the GHG (Greenhouse Gases) emissions.

Brazilian power generation sector has recently undergone important changes. Historically dominated by hydropower, an increasing share has been generated from thermal electricity processes, mainly from fossil fuels (coal, natural gas, fuel, oil and diesel). Although there is an official commitment to increase the share of wind and solar in the Brazilian energy matrix, there has been modest governmental support for those forms of energy.

As a consequence of those developments, the projected GHG energy related emissions for Brazil has shown an increasing participation in the Brazilian GHG total emissions, with a concomitant change in its profile, due to the increased reliance on thermal sources of energy because of the adverse hydrological conditions prevailing in recent years. This trend, combined with the expected significant growth in Brazil´s electricity demand over the next decade, of about 6GW of additional installed capacity per year through 2024 (EPE, 2018), contributes to the projected result of a significant increase in GHG emissions from the energy sector in Brazil. However, considering that Brazil has significant renewable energy potential, policies aimed at increasing the share of wind and solar in the electricity mix would be a significant step towards greening the energy sector as well as the improvement of the energy decision making process, which requires the integration between climate and energy policies in Brazil.

Overview: Brazil´s New Climate Policy and Energy Trends

Brazil´s Nationally Determined Contribution (NDC) calls for reducing greenhouse gas (GHG) emissions 37% below 2005 levels by 2025; 43% by 2030. This has been assessed as a major step taken by a developing country, entailing an absolute reduction of emissions from a base year. This approach offers greater certainty that emissions will be cut even if Brazil´s economy expands. In spite of this positive aspect, it is almost a consensus that Brazil could have gone much further in its offers embodied in its NDC. Two main sources of emissions reductions are from deforestation and from increasing the share of renewables, mostly wind and solar. In this research being undertaken, the focus will be on increasing the share of renewables in the Brazilian energy matrix, in an attempt to focus on the appropriate policies that would lead to their larger participation.
In fact, there has been a marked deterioration on the Brazilian energy matrix, in spite of still being a very clean one. This is because hydropower is being substituted by thermal sources. The NDC proposes reaching a 45 % share of renewables in the energy mix by 2030. This target does not actually represent progress considering that renewables made up nearly 46% of primary energy production in 2013, according to the 2014 National Energy Balance. Yet, this movement is concomitant to the target to increase the share of renewables beyond hydropower to generate electricity to 23% by 2030. This means that biomass, solar and wind will play a more important role in Brazil´s overall energy mix than in the

current situation: hydropower generates about 66 % of Brazil´s electricity while other renewable energy sources less than 10%

Brazilian GHG Emissions Profile is Changing

Following the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2006) the Brazilian Ministry of Science, Technology and Innovation (MCTI) publishes information on national GHG emissions divided into main sectors grouped according to processes, sources and sinks: energy, industrial processes and product use, waste; and agriculture, forestry, and other land use, land-use change and forestry (LULUCF). The most recent GHG emissions estimates of the five broad sectors show that the bulk of Brazilian recent GHG emissions growth has come from energy, with a value of 24% for the 2005-2011 period. This result expresses two interdependent factors. The first is related to the fact that the key driver of climate change in Brazil used to be LULUCF activities (up to 2005), so policies to control emissions focused on controlling those activities. In this context, and because of the historically low-carbon content of main energy sources, there has been limited pressure on Brazil to explore energy efficiency and renewable energy (beyond hydropower and bioenergy)

The point to be highlighted is that although renewables account for 39.4 % of Brazil´s total energy supply in 2014 (EPE, 2015), therefore assessed as being essentially clean, its share of the total energy mix is on the decline, with the faster growth of non-renewable compared to the growth of renewable energy. Estimates by the WRI point out that around 80% of the energy investments in Brazil for the period 2013-2022 will be allocated to fossil fuels, implying that the country is heading for a carbon intensive lock-in.
Brazilian power generation sector is undergoing important changes. Historically dominated by hydropower, an increasing share of power is now generated from thermal electricity processes, including from fossil fuels (coal, natural gas, fuel, oil and diesel) biomass (sugarcane bagasse in particular) and, to a lesser extent, uranium. The PDE 2023 projects significant growth in Brazil´s electricity demand over the next decade, resulting in the need for about 6 GW of additional installed capacity per year through 2023 (EPE, 2014).

These two trends combined tend to result in a significant increase in GHG emissions. However, this possible result is far from being an inexorable one since Brazil has a very expressive renewable potential that could and should be better exploited with appropriate policies and institutions designed for the specific purpose of greening the power generation sector.

Inevitably, Brazil would be heading for a significant increase in GHG emissions if a new pattern is not designed for the power generation sector growth. Brazil has significant renewable energy potential, with many opportunities to green this sector in particular. Increasing the share of wind and solar in the electricity mix would be a significant step towards greening the energy sector.

Moreover, a very important research topic, often neglected, refers to the improvement of the governance in which energy decisions are taken, in an attempt to point out the possibilities to improve integration between climate and energy policies in Brazil.

Increasing the Share of Wind and Solar in the Electricity Mix: high capital costs

Both forms of energy, wind and energy, show a remarkable potential power in Brazil. But because of the high capital costs involved and the logistics associated, they still contribute in an insignificant way to power generation in Brazil. This is really an unsatisfactory situation because of the many benefits associated with those forms of energy sources. Although there is an official commitment to increasing the share of wind and solar in the Brazilian energy matrix, there has been limited support for those forms of energy. In fact, the National Energy Plan (PNE, 2050), elaborated by the governmental Energy Research Company (EPE), estimates a relative increase from thermal power plants fuelled by natural gas and coal, even if it is acknowledged the importance and relevance of investing in modern renewables energies such as wind and solar.

Solar Energy

On the supply side, it is imperative to reduce capital, operational and maintenance costs through subsidies and other incentives, promoting research and development, adequate funding and standards/ regulatory norms to reach uniformity among regions. On the demand side, strong action is required from public agents to create incentive to agents to switch to solar energy, including feed in tariffs, net metering schemes, as well as simplified procedures for grid access. Exploring new financing channels like the development of green markets would be a very relevant initiative to move beyond the subsidised credit from BNDES.

Wind energy

It is envisaged that modern renewable sources, in particular wind, will increase their share only from 4.3 % to 5.2% between 2013 and 2022 (EPE, 2012) because natural gas or coal- fired power plants are being given priority to meet baseload power needs (ACENDE, 2014).

Although costs have been declining, other factors have played a role to explain this modest result. Uncertainty on the rules that regulate renewable electricity generation have decreased the attractiveness of investments in the sector. Also wind farms in Brazil have suffered from grid connection delays, a problem being addressed now. Because of security concerns, policymakers still assess the installation of more fossil-fuelled power plants as the default choice. The delays in expanding the grid to include wind and solar energy sources, and for energy security reasons, the government has decreased the participation of renewable new capacity auctioned. Fossil-fuel power plants have increased due to the easiness with which they are built and connected to the grid, and, moreover, they do also represent reliable (non-intermittent) sources able to provide energy over a longer time horizon. Exploring new financing channels like the development of green markets would be a very relevant initiative to move beyond the subsidised credit from BNDES.

Methods

As part of UNFCCC agreements, the Brazilian Ministry of Science, Technology and Innovation (MCTI) publishes information on national GHG emissions divided into main sectors grouped according to processes, sources and sinks: energy, industrial processes and product use, waste; and agriculture, forestry, and other land use, land-use change and forestry (LULUCF). The most recent GHG emissions estimates for the five broad sectors show that the bulk of Brazilian recent GHG emissions growth has come from energy, with a value of 24% for the 2005-2017 period. This result expresses two interdependent factors. The first is related to the fact that the key driver of climate change in Brazil used to be LULUCF activities (up to 2005), so policies to control emissions focused on controlling those activities. In this context, and because of the historically low-carbon content of main energy sources, there has been limited pressure on Brazil to explore energy efficiency and renewable energy, in particular wind and solar energy.

Two sets of information will be used : the projected energy mix provided by the PDE 2024 (Ten Year Energy Plan elaborated by EPE, 2019) combined with the projected emissions estimated through the Brazilian National GHG Inventory to assess how the GHG profile might be changing over time as a consequence of changes in energy mixes. Following it, using simulation techniques, we proceed to estimate what would be the necessary paths for the shares of wind and solar energy in order to stabilize emissions from the energy sector for the period 2020-2030, assuming different rates of growth for the Brazilian economy.

Expected Results

It is expected that there will be an important increase in GHG emissions from the energy sector, if Brazil does not devise a new pattern for the energy sector growth. However, this possible result is far from being an inexorable one since Brazil has a very expressive renewable potential that could and should be better exploited with appropriate policies and institutions designed for the specific purpose of greening the power generation sector. Once the necessary shares of wind and solar energy for stabilising the GHG emissions are estimated, a discussion on the policy and institutional options for increasing their participation in the energy sector is done, in an attempt to identify the main factors limiting a more widespread implementation of renewables (wind and solar).

Both forms of energy, wind and solar, show a remarkable potential power in Brazil. But because of the high costs involved and the logistics associated, they still contribute in an insignificant way to power generation in Brazil. This is really an unsatisfactory situation because of the many benefits associated with those forms of energy sources. As Pao and Fu (2013) highlight, investing in wind and solar power generation can enhance energy security, reduce GHG emissions and create more jobs in Brazil.

On the supply side, it is imperative to reduce capital, operational and maintenance costs, through appropriate policies, promoting research and development, adequate funding and standards/ regulatory norms to reach uniformity among regions and a stable regulatory framework. On the demand side, policy making is required from public agents to create incentives to agents to switch to solar energy, including feed in tariffs (FIT), and net metering schemes, as well as simplified procedures for grid access. It would be extremely relevant that Brazil is in a position to assess lessons from international experience so far, to identify which measures and policies have proved most effective towards the aim of disseminating the use of solar and wind energy. Equally important would it be to improve the governance of energy policies in Brazil towards a greener energy matrix. Therefore, this research will try to identify an appropriate institutional framework for the Brazilian energy sector designed for integrating climate and energy policies.

References

De Gouvello et al, 2010, “Energy: low carbon emissions in Brazil-synthesis report”, World Bank Working Paper 59538, World Bank.

EPE, 2019, Plano Decenal de Expansão de Energia, Empresa de Pesquisa Energética, Ministério de Minas e Energia,

EPE, 2013, “Termo de Referencia para elaboração do PNE 2050” Nota Técnica DEA05/13

La Rovere et al, 2013, “ Brazil beyond 2020: from deforestation to the energy challenge” Climate Policy 13, 70-86

MCTI, 2013, Annual greenhouse gas emissions estimates, Ministerio de Ciência Tecnologia e Inovação, 2013

Observatorio do Clima, 2018, “Proposta do observatório do clima para a INDC do Brasil, Observatorio do Clima

OECD, 2012. “Green growth and sustainable development”, OECD

Pao, H and C. Fu (2013). “Renewable energy, non-renewable energy and economic growth in Brazil” Renewable and Sustainable Energy Reviews, 25: 381-392