

Analysis of Renewable Energies in Uruguay: Current Status, Challenges and Prospects

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Introduction

The need to rethink energy supply is a topic that increasingly occupies the public debate for some time now, and it comes up again, with vigor, in the seventeen sustainable development goals (SDGs) of the United Nations 2030 Agenda. That document, in fact, frames development policies from a sustainability perspective to guide the strategic choices of the signatory countries both within their national policy and at the level of international cooperation. The United Nations Development Program (UNDP) states that in order to have a decent life, the minimum daily electricity consumption per person is 0.5 kWh. To date, one in five people worldwide do not have access to electricity. Moreover, the global economy is still highly dependent on fossil fuels, which contribute to rise the greenhouse gas emissions, with serious humanitarian, social and environmental impacts.

SDG 7, committed to *Affordable and clean energy*, intends to ensure universal access to sustainable, reliable, and modern energy to improve the livelihoods of millions of people (UN, 2015). Through this goal, the organization encourages the use of renewable energy instead of fossil fuels, and promotes energy efficiency to create a fully sustainable economy for the benefit of both society and the environment. This SDG aims to significantly increase the share of renewable energy in the global energy mix, double the global rate of energy efficiency improvement, promote investment in energy infrastructure and clean energy technologies, as well as strengthen international cooperation for these purposes. By structurally targeting renewable energy sources, it is possible to accelerate the ecological transition and beyond: the current energy crisis confirms that in order to have more self-sufficient, economic and stable models, renewables cannot be ignored.

Having functional systems able to meet demand in a timely manner allows to manage price volatility, while interventions to stabilize it permits to adjust to fluctuations in electricity supply and price. In a scenario where energy and commodity prices are rising, energy efficiency to control demand becomes central to both overall system operation and cost containment.

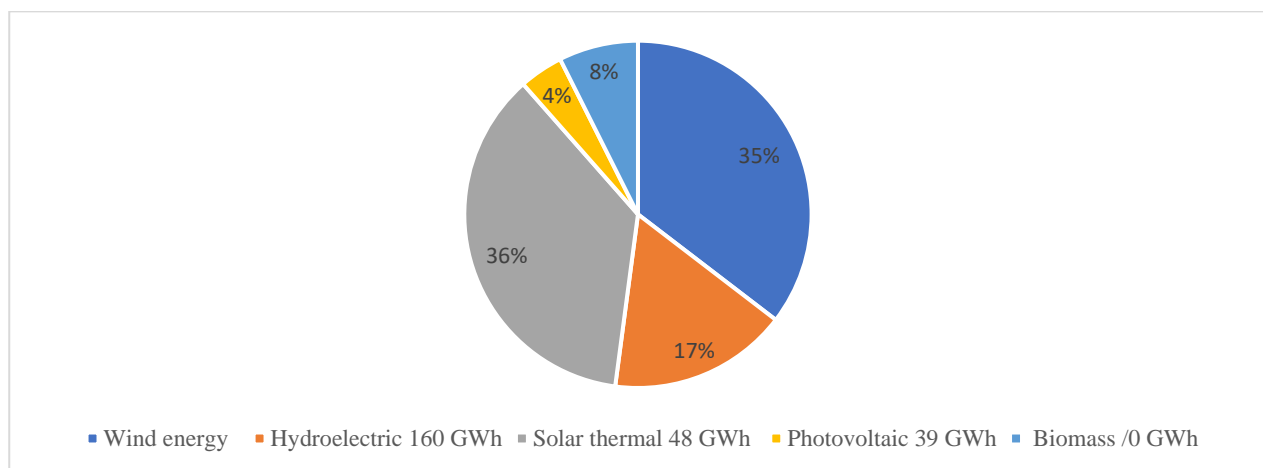
The aim of this paper is to analyze the development and use of renewable energy in Uruguay. After a brief introduction on the contemporary need to reshape the energy supply and consumption in a global commitment, this article examines the path traced by the South American nation, whose energy consumption comes almost entirely from renewable sources. The geographical and territorial

conformation of the country and a series of avant-garde policy choices are guiding Uruguay toward the green future –to which many countries aspire not without some negativities, however.

The *revolución verde* in Uruguay

Due to its landscape of peneplains and hundreds of miles of ocean and river coastline, Uruguay is ideally located for the generation of solar, wind and hydro energy. In the last decade it has positioned itself as one of the countries with the best energy transition to renewable sources, both in the region and in the world. In April 2021, the country was, for the second consecutive year, the best positioned South American nation in the global index of the World Economic Forum, in a general context of growth in renewable energy and services in the Latin American context (WEF, 2021: 12). Moreover, at the end of 2019, the International Energy Agency (IEA) ranked Uruguay as Latin America's leader in energy production and fourth in the world in terms of electricity generation levels from wind and solar sources. In fact, wind, solar and biomass energy began to play such a highly relevant role in Uruguay that in 2019 they reached superior shares in the total offered. According to the balance sheet of the Administración Nacional de Usinas y Trasmisiones Eléctricas (UTE), 55.6% corresponded to hydraulic energy, 33.6% to wind, 6% to biomass, 2.8% to photovoltaic energy and 2% to thermal energy. As of 2005, neither wind nor solar energy had contributed to production. These data appear even more interesting when compared with those of a few years ago: in 2019 renewable energies represented 98% of the total energy matrix, while in 2005 they were 37%, according to the National Energy Balance (BEN) 2019 of the National Energy Directorate of the Ministry of Industry, Energy and Mining.

Currently, the energy partition is set as depicted in the graph below, which accurately shows the composition according to energy source:



Source: UTE, 2022.

The current data are interesting, especially when analyzed in light of the path of improvement pursued by the South American country. Uruguay, based on the Energy Policy 2005-2030, first approved by decree of the Executive Power in 2008 and then agreed upon in an inter-partisan manner, has been a pioneer in actions aimed at incorporating renewable energy sources. Through its results, it has managed to reduce international dependence, price uncertainty and the effects generated on the environment. Thanks to this policy, Uruguay's primary energy matrix in 2017 was composed of 63 % of renewable sources. In this way, the country aligned with international trends in the implementation of an energy matrix with a preponderance of more environmentally friendly and socially beneficial energies.

The success of the Uruguayan model depends on three factors: credibility, thanks to a stable and economically sound democracy (which is not taken for granted for a South American country); favorable natural conditions such as wind, sunshine and a lot of biomasses derived from agriculture; and very strong public companies, which have initiated agreements of various kinds with private individuals, coordinating on a statewide basis the interventions to be carried out. All this has made it possible to achieve important results not even having initiated particularly expensive infrastructure works: several wind farms have been installed with hundreds of blades, making unnecessary to build more invasive infrastructure such as new hydropower plants, which usually require the construction of a reservoir and dam, with obvious repercussions for the environment.

Already at Cop-21, on climate change in Paris, Uruguay had claimed a leading role, realizing the shift from oil dependence to green electricity production. Recent government policies have enabled Uruguay to reduce its greenhouse gas emissions by an impressive 88% in 2017 from the previous average for the 2009-2013 period (Bertram, 2020). At the institutional level, in 2010 the Ministry of Energy, Mining and Industry of Uruguay approved the Decree 354 on the promotion of renewable energies in order to increase the share of electricity generation from renewable sources in the country. Moreover, in 2020 the Ministry of Environment was created and in 2021 the Long-Term Climate Strategy has been implemented (OECD, 2022: 334).

A concrete policies example for the international economy that demonstrates the importance of diversifying and basing much of the electricity generation on wind and solar without a back-up of dirty energy in a relatively short time, generating visible change and benefit for both the economy and society as a whole. Ultimately, the small Latin American country is consummating a profound energy revolution, with the goal of becoming completely carbon neutral by 2030 (Zou, 2021).

Between Critical Aspects and Reference Model

The civil-military dictatorship that began in 1973 promoted the National Electricity Law (Ley Nacional de Electricidad) which eliminated the social dimension of the tariff charts and annulled the monopoly of generation and distribution held by the National Administration of Power Plants and Electrical Transmission (UTE, Administración Nacional de Usinas y Trasmisiones Eléctricas). However, the most relevant changes would occur in the 1990s, when the government of Luis Alberto Lacalle sought the privatization of public companies, a measure that was revoked through a plebiscite in 1992. As of 2005, the arrival of the Frente Amplio in government led to the enactment of a plan for 2030 that takes up the vision of energy as a strategic resource (IRENA, 2015). This plan also considers the access to energy a right and proclaims the need for energy policies to have a social focus. Despite the Frente Amplio's own vision of energy as a strategic resource, the first government of Tabaré Vázquez (2005-2010) carried out an unprecedented policy of privatization of the energy generation sector. Several wind energy projects were awarded to private companies, particularly foreign ones, through a bidding process, with an intensity that placed Uruguay at the forefront of renewable energy generation in the region. If biomass generation and marginal photovoltaic production are added to wind projects, 81.1% of installed electricity capacity in Uruguay was controlled by private capital in 2020. During the Frente Amplio government, the privatization of electricity generation was a product of the shift towards renewable resources, seeing the private sector as the best administrator of electricity and questioning both the role of the UTE and the access to energy as a right. Ultimately, these measures culminated in the commercialization of the sector through the foreignization of titles and assets. So far, the logic of privatization in the 1990s has been completed, and the market has concentrated in the field of “large consumers”. Composed mainly of industry, the sector has subsequently gained institutional recognition and an enormous capacity to lobby and influence the energy policy.

These changes in energy policy have come with the actual universalization of electricity: as for example, in 2006, only 2.3% of Uruguayan households did not have access to energy and another 4% were not properly connected. However, the relative universality of access does not hide the significant social inequalities that the electricity system reproduces. The problem of access to electricity, especially after the ecological transition, is related to the cost of tariffs. As in other countries on the continent, tariffs are a fundamental element of the electricity debate in Uruguay, an issue also present in other countries, such as Argentina. There are several electricity tariffs, for instance, a differentiated price for residential, medium, and large consumers. This results in different relative costs for consumers, based on households' class or types of industry. The price of residential electricity in Uruguay is the most expensive in the region, according to a report on energy indicators

by the consulting firm SEG Ingeniería (2022). This tariff has a cost of US\$239 per megawatt/hour, which is four times that of Paraguay, where it costs US\$59, and more than three times that of Argentina, where the cost is US\$66. It is also higher than the price in Chile (US\$186) and Brazil (US\$168). Besides the aforementioned different tariffs by type of consumers, another-component of the high cost of tariffs is VAT, currently at 22%.

In addition, it is important to point out that SEG Ingeniería (2022) reports from data provided in the 2020 BEN, that during that year Uruguay increased its emissions of CO₂, a gas related to the greenhouse effect, despite the reduction in mobility that was generated for several months. In addition to the pandemic, the other event, much better known and recurrent affecting the energy sector was the 2020 drought that provoked water contributions to fall among the lowest in decades over the basins of the Salto Grande and Rincón del Bonete. As a result, the electricity generation matrix showed a drop in hydroelectric production with respect to 2019, which caused a 2.6-fold increase in fossil thermal generation.

Despite these last reported negative aspects and some inequalities identified in the system, Uruguay is the benchmark for many European and non-European states, which look at the small Latin American country as a model for renewing their energy policies. Now in the so-called second phase of the energy transition, this nation represents an innovative model not only in the development and implementation of energy policies but also in its ability to set a point of reference to reach. Specifically, it can push other Latin American countries toward best practices as well; secondly, it can nurture the processes of democratization of energy through the fortification of a collective consciousness that looks at the environment as an asset to be preserved and conserved.

Conclusions

The portrait presented in this article prompts to several reflections. The first certainly consists in admiration for the “energy success” achieved by such a small and very often unfairly underestimated country in the international assessments. Second, it points out to how the rise of renewable energy and the goals for total decarbonization have, however, generated several social imbalances that need to be corrected by means of *ad hoc* interventions, both political and private. Notwithstanding, Uruguay can be a model for many countries, European and non-European, that wish to move forward in the progression of sustainable energy. Finally, we believe that the analysis proposed here has highlighted how Uruguay can be a most attractive country for foreign investors due to a set of favorable factors: legal security, availability of agricultural raw materials, skilled labor, and a modern and effective investment incentive program. Indeed, the government has significantly improved and

increased tax benefits and exemptions for foreign investment, particularly through the creation of Free Zones and Industrial Areas, with a focus on meeting demands from the international market.

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