RENEWABLE ENERGIES
IN URUGUAY

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Uruguay XXI
INVESTMENT, EXPORT AND COUNTRY
BRAND PROMOTION AGENCY

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1. WHY INVEST IN RENEWABLE ENERGIES IN URUGUAY?

- **Uruguay is on a path of strong transformation in terms of its energy policy, based on the definition of a long-term policy and an appropriate institutional and regulatory framework that is being adapted as the implementation of the plan advances.**

- This process positions Uruguay at the forefront of renewable energy use in the world. Between 2017 and 2021, 94% of Uruguay's electricity generation originated from renewable sources. In particular, the contribution of wind energy places Uruguay as a global leader along with Denmark, Ireland and Portugal[1].

- **Renewable energy investment exceeded US$ 8 billions in the last decade and is still a national priority today.**

- The first stage of the transformation of the energy matrix was based on a public-private partnership model, in which the public sector played the role of system coordinator and administrator of the auction scheme, generating certainty for national and international investors.

- The International Renewable Energy Agency (IRENA[2]) highlights Uruguay's promotion and incentive model, and includes the calls made by UTE as examples to follow in its guide for the design of auctions. It highlights the achievement of incorporating strong private participation in investment through innovative promotion schemes without relying on direct subsidies.

- The achievements are reflected in the diversification of the energy matrix, the guarantee of self-sufficiency and the reduction of dependence on fossil fuels. Uruguay is currently the second country in the world with the highest share of variable renewable energies according to the REN21 report (2021)[3].

[1] According to en 21 (link)
[2] IRENA - Subastas de Energía Renovable
[3] Source: VRE Generation: REN21 - Renewable 2021 Global Status Report (link)

- **Uruguay's energy policy is aligned with the commitment to contribute to the mitigation of greenhouse gas emissions and the concern for climate change. Uruguay participated at the end of 2019 in the 25th Conference of the Parties to the Kyoto Protocol[4].** In that instance, governments unanimously agreed on the status of urgency and the need for action, inviting countries to commit to becoming carbon neutral.

- For the next few years Uruguay has the challenge of advancing in the second stage of the energy transition, with the following main goals:
  - **Direct electrification of end uses.**
  - Development of a Green Hydrogen Economy.
  - To continue with the addition of renewable sources in the matrix.
  - To promote coordination with neighboring countries, strengthening regional energy integration.
  - Consolidation of a Smart Grid to efficiently coordinate energy supply and demand.
  - Continue with the adoption of energy storage technologies.
  - To strengthen reconversion of agricultural waste to produce energy, turning an environmental liability into an energy asset, adding the use of this type of supply to the technical-economic scheme with which the country's sector is managed.
  - To continue the analysis of energy recovery from solid urban waste.
  - To incorporate clean energies into the transportation sector by applying the latest available technologies, especially in urban public transportation fleets and electric utility vehicles. Start exploring hydrogen for heavy and long distance transport.

- Finally, in recent years, the Green Bond market has shown significant growth in the world. This type of bond consists of debt issuance by public or private institutions for the development of projects related to the environment and climate change. The Ministry of Economy and Finance (MEF) in Uruguay is designing a sustainable sovereign bond linked to environmental issues, which will allow financing of some of the government's most strategic goals in terms of energy policy[5].

[4] COP25, meeting of the signatories to the United Nations Framework Convention on Climate Change.
[5] For more information see: Noticia Presidencia de la República

2. FIRST STAGE OF ENERGY TRANSFORMATION

Historically, the Uruguayan energy system was dependent on hydroelectric power generation, which represented a vulnerability to adverse weather conditions. Years of low rainfall resulted in low hydroelectric power generation, which had to be compensated with greater use of oil and its derivatives in thermal power plants or through electricity imports. This changed in the last decade and a half, when Uruguay turned to clean and competitive energies to meet the country's growing energy demand, strengthening the energy supply by reducing the relative weight of the main energy sources, which are vulnerable to external factors.

Biomass, wind energy and photovoltaic energy were the main sources responsible for the changes in the energy matrix. The incorporation of renewable energy became state policy, based on a long-term strategy with broad political consensus and within the framework of a period of strong economic growth.

2.1. ENERGY SUPPLY MATRIX

Energy supply in 2020 stood at 5,400 ktoe, according to the Energy Balance by the National Energy Authority (DNE), which represented an all-time record. This figure marks an increase of almost 80% over 2005 levels.

This increase was accompanied by a change in the composition of the matrix. Energy obtained from conventional generation sources significantly reduced its share in the total supply, from 58% in 2005 to 39% in the 2017-2020 average[6].

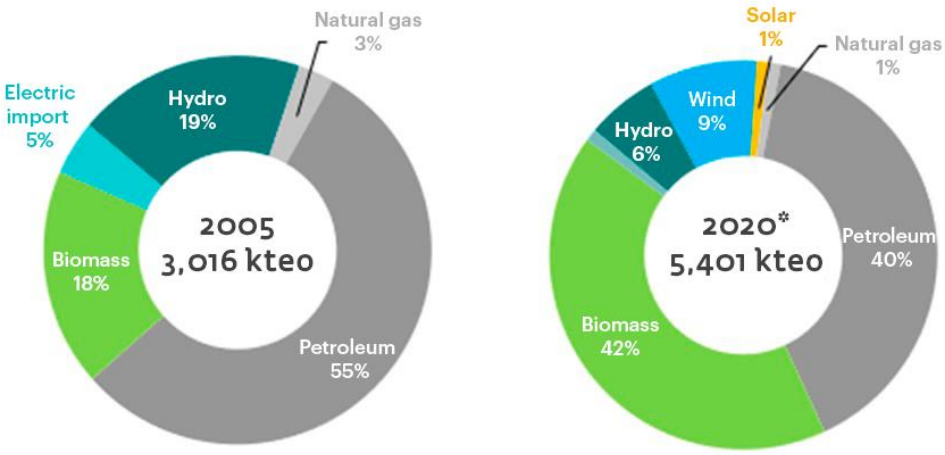
Biomass, wind and solar energy began to play a more relevant role, reaching shares of 42%, 9% and 1% of the total supply in 2020, respectively, when in 2005 neither wind nor solar energy contributed to production (see Graph 1).

Hydropower, on the other hand, has decreased its weight in the supply, representing 10% of the total between 2017-2020 (6% in 2020 due to the very low hydraulicity), compared to 19% in 2005. The change was due solely to the importance gained by the other renewable sources. With respect to this type of energy, it should be noted. that the country's large water resources are already almost fully utilized and the future increase in supply will only be possible through small hydroelectric power plants.

[6] The 2017-2020 average is considered due to the low hydraulicity recorded in the last year.

Thus, renewable energies will represent 58% of the total energy matrix in 2020 (compared to only 37% in 2005).

GRAPH 1 - ENERGY SUPPLY MATRIX-URUGUAY (KTOE) - 2005 VS. 2020



Source: Energy Balance, DNE- MIEM.

Finally, imports of electricity have decreased systematically lately and have been irrelevant in recent years. The specific electric power purchase operations were based on commercial opportunities to take advantage of a lower-cost supply, and not to cover the country's energy supply needs.

2.2. ELECTRICITY SYSTEM IN URUGUAY

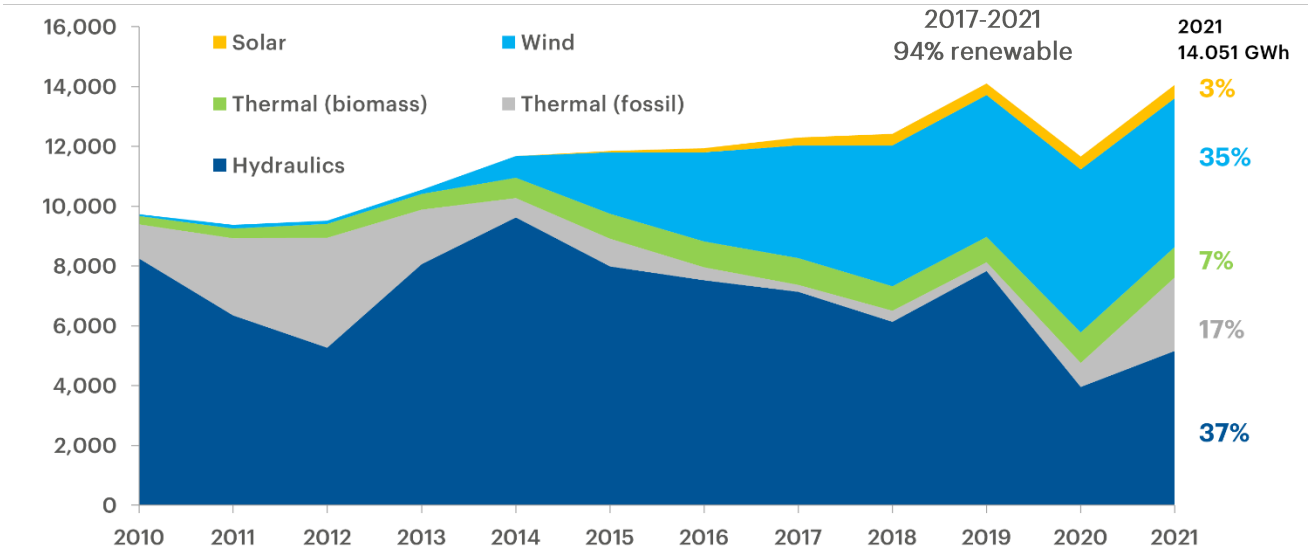
With an electricity grid of 83,277 km, the country has an electrification rate that covers 99.8% of households. The Uruguayan national electricity system is composed of two large high-voltage transmission grids. A 1,078 km 500 kV system links the Salto Grande dam (Uruguay River) and the Terra, Baygorria and Constitución dams (Negro River) with the Greater Montevideo area, the largest consumption center. Another 150 kV network of 3,923 km links the generation plants with almost all the provincial capitals and main consumption centers (72 150 kV stations).

The state-owned energy company UTE is the main player in the sector, which produces and also purchases electricity from private producers, and distributes it to consumers. Contracts entered into with private companies are therefore implicitly guaranteed by the State. In practice, UTE has been the executor of the public policies that have allowed the remarkable diversification of the Uruguayan energy matrix.

Uruguayan electric power production has maintained a steady growth path, and according to BEN data, in 2019 exceeded 16,000 GWh, the highest level recorded in the historical comparison. In 2020, generation stood at 13,500 GWh, falling 16% compared to the previous year. The drop is explained by a reduction in demand derived from less exports, due to the lower hydroelectric power generation, halving in 2020 compared to the previous year.

In the last five years, the average electricity generation from renewable sources was 94%, while in 2021 it stood at 83%, due to the low rainfall registered since 2020 and the strong demand for energy from Brazil, which led to a historical export in value exported in 2021. Separating the punctual effects registered in the last year, the trend is that non-conventional renewable sources (wind, biomass and photovoltaic) continue to gain share in the Uruguayan electricity matrix. In 2021, they accounted for 46% of total electricity generation. In contrast, thermal power production from fossil sources plummeted in the last 10 years, representing 6% in the 2017-2021 average.

GRAPH 2- ELECTRICITY GENERATION BY SOURCE (GWH)



Source: Uruguay XXI based on data from BEN 2020[7] and preliminary data from UTE for 2021.

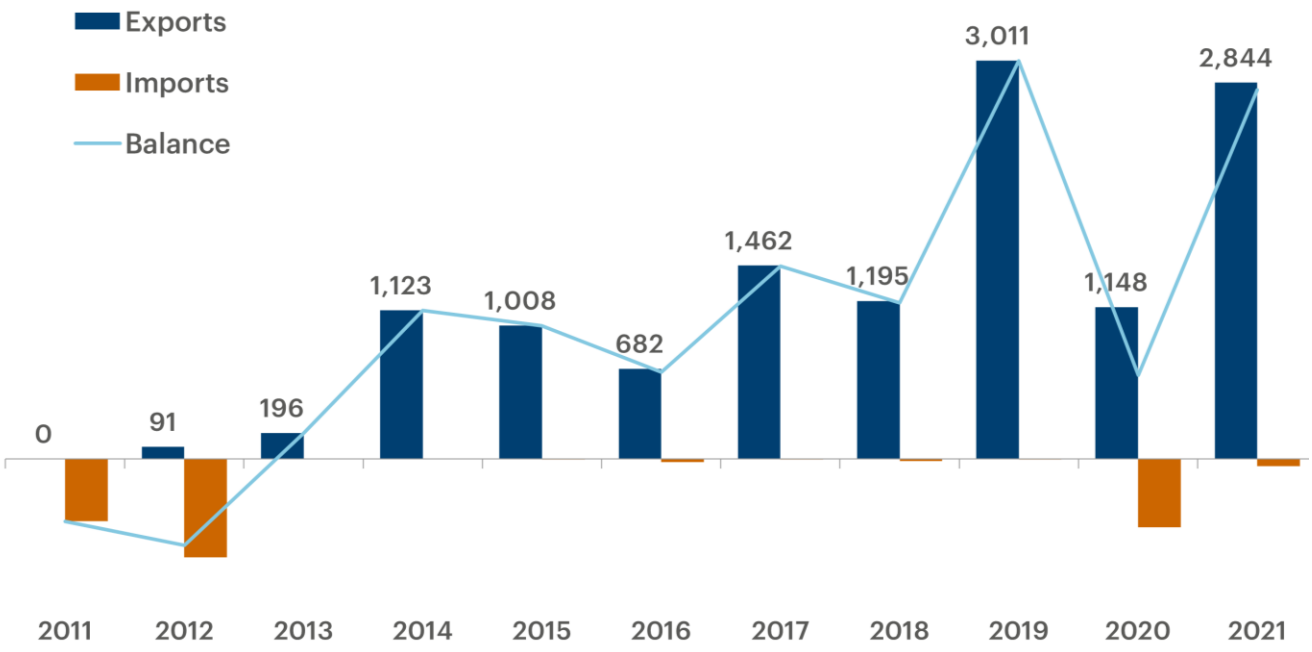
Three connections with Argentina and two with Brazil allow Uruguay to exchange electricity with neighboring countries. Uruguay has become a net exporter of electricity since 2013. In turn, it is worth noting that since the end of 2017 Uruguay has allowed the export of electricity to the private sector to Argentina. Although that

[7] The BEN considers all the energy generated in the country, both for self-consumption and generation injected into the National Interconnected System (SIN).

authorization is still in force, the wind farms covered by that measure opted for a long-term contract with UTE and therefore are currently not available for such export (no private exports were recorded since 2019).

According to data from the UTE Administration, in 2021, electricity exports exceeded 2,800 GWh, more than two times the exports of 2020. External sales were mainly destined to Brazil. Thus, electricity exports accounted for 20% of the total generation in 2021.

GRAPH 3 - ELECTRICITY EXPORTS AND IMPORTS (GWH)



Source: Uruguay XXI based on UTE data.

Finally, the Uruguayan electricity system stands out for its reliability compared to other Latin American countries. According to the Global Competitiveness Index of the World Economic Forum, Uruguay ranks first in Latin America for quality of electricity supply in the country. In October 2019, UTE received the "2019 Gold Award" granted by the Regional Energy Integration Commission (CIER), for being the best evaluated power company in the judgment of its customers among 42 companies in the region (both public and private). According to CIER, 88.6% of UTE's customers consider the service to be good or very good[8].

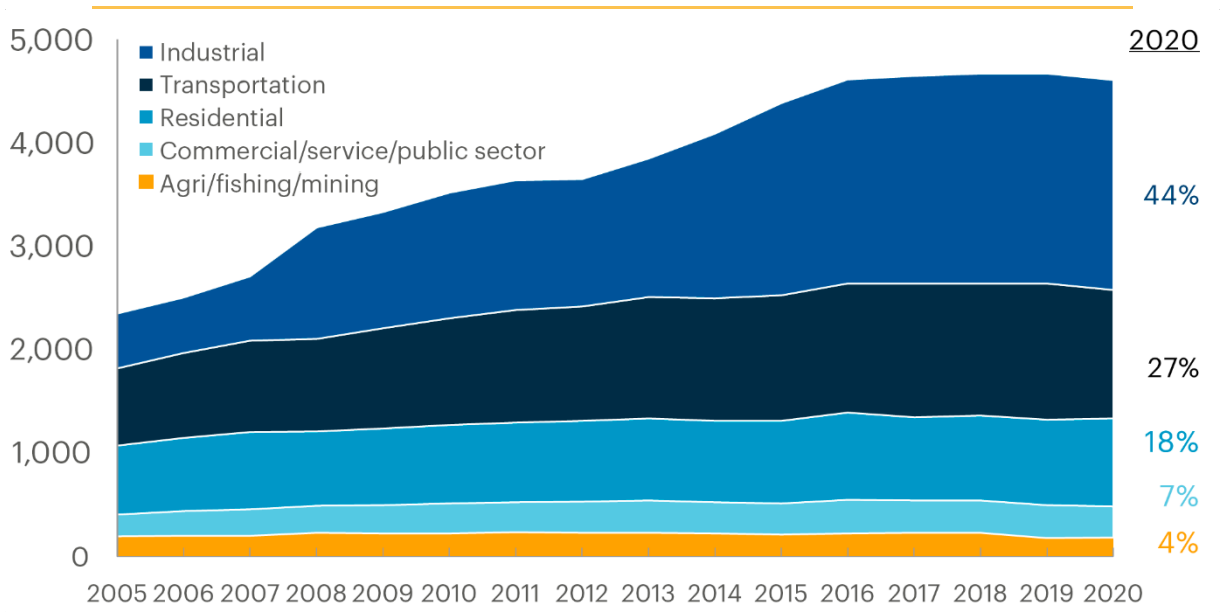
[8] See https://www.presidencia.gub.uy/comunicacion/comunicacionnoticias/ute-premio-oro

2.3. EVOLUTION OF ENERGY DEMAND AND CONSUMPTION

The Uruguayan economy has shown an uninterrupted growth between 2003 and 2019, with energy demand strongly expanding. The industrial sector was the main consumer, due to the increase in the sector's production levels and especially due to the development of new activities with high energy demand, such as the cellulose pulp industry. The second sector with the highest growth in energy demand was transportation, which is associated with both productive activities and household consumption.

In this context, the final energy consumption for 2020 was 4,607 ktoe, a 31% increase compared to a decade ago. Industry is the sector with the largest share of consumption, with 44% of total energy in 2020. However, as shown in the following graph, energy consumption has remained stable since 2016, showing practically unchanged levels in the last five years.

GRAPH 4 - FINAL ENERGY CONSUMPTION BY SECTOR (KTOE)



Source: Energy Balance, DNE- MIEM.

With respect to future demand projections, the DNE conducted a prospective study of energy demand for 2015-2035.[9] Table 1 shows the projections of final energy demand by sector for two possible scenarios (both assume the construction of a third pulp mill). The baseline scenario assumes that there will be no significant changes within the structure of the sectors, with the current efficiency measures and presumable technological

[9] Estudio de Prospectiva de Demanda Energética - DNE.

improvements. The second scenario assumes that a series of policies aimed at increasing the efficiency of each sector will have been implemented, deepening the actions of the baseline scenario.

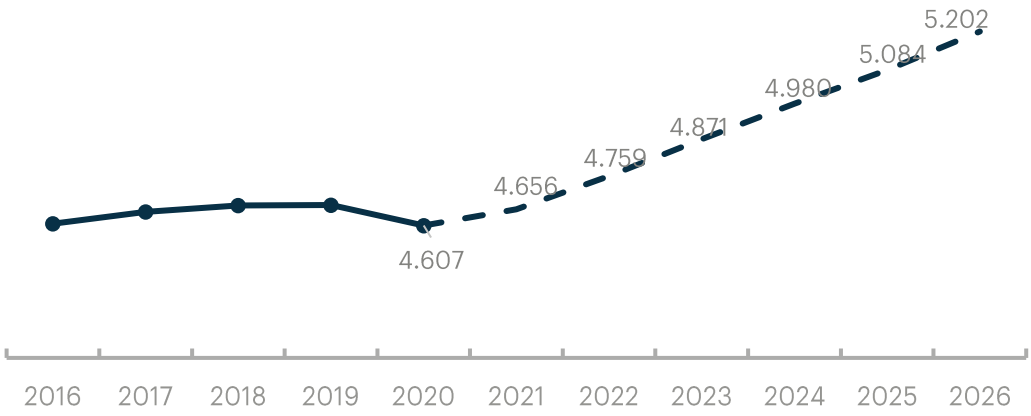
TABLE 1 - ENERGY DEMAND BY SECTOR: AVERAGE ANNUAL GROWTH. 2015-2035

Scenarios	Residential	Commercial Services	Industrial	Primary Activities	Transportation	Total
Trend	2.0%	2.9%	3.2%	2.8%	2.8%	2.8%
Policy and Efficiency	0.5%	1.8%	2.7%	2.5%	2.3%	2.2%

Source: DNE

On the other hand, the latest Seasonal Programming Report prepared by the Electricity Market Administration (ADME)[10] forecasts that electricity demand will increase at an average annual rate of 2% between 2020 and 2024. This projection contemplates the effects of Covid-19 over 2021, assuming a slight growth of 1% for this year, to resume dynamism (with an average annual rate of 2.2% between 2022 and 2026).

GRAPH 5 - PROJECTED GROWTH IN FINAL ENERGY CONSUMPTION 2021 - 2026 (KTOE)



Source: Prepared by Uruguay XXI based on DNE and ADME.

In this context, it should be clarified that although energy demand is expected to continue to grow in the coming years, it is expected to be at a more moderate rate. Looking at electricity production, it is projected that the momentum of the electricity sector will be associated with the development of mobility (related to

[10] Seasonal Programming - ADME

hydrogen production and the incorporation of battery-electric vehicles). It is worth noting that the projection did not consider large projects of green hydrogen production.

3. SECOND STAGE OF THE ENERGY TRANSITION

The Energy Policy 2005-2030 was approved in 2008 and establishes the guidelines in the field of energy at the national level with a long-term view, betting on the diversification of the energy matrix and the incorporation of local sources, particularly renewable energies. This pursues multiple goals: to achieve energy sovereignty, reduce costs, activate the national energy industry, reduce dependence on oil and mitigate the polluting effects by reducing the emission of greenhouse gasses. Uruguay has taken a successful path in energy matters within the framework of this long-term State policy. The first stage of the transformation has already been completed and consisted of the reconversion of the electricity matrix towards renewable energy sources: hydro, biomass, wind, and solar.

However, if the entire energy supply matrix is considered and not only electricity, 39% of the energy used was generated from fossil fuels between 2017-2020. In this context, Uruguay is working to achieve total decarbonization of the matrix.

Worldwide, efforts are mounting to avoid climate change and limit global warming, framed by the 2015 Paris Agreement between the parties to the United Nations Framework Convention on Climate Change. The Intergovernmental Panel on Climate Change (IPCC) established that global temperature must be stabilized below a 2°C increase while continuing efforts to limit that increase to 1.5°C, which requires that CO2 equivalent emissions be reduced to zero. Achieving this balance between carbon sources and sinks is called "net zero emissions" or "carbon neutrality."

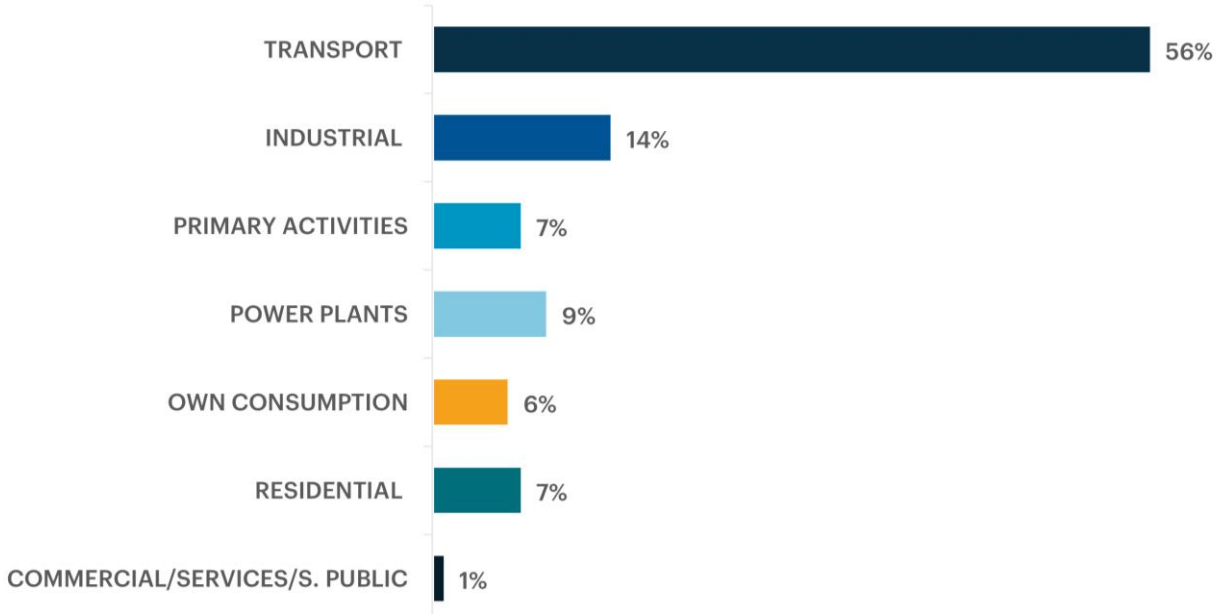
The reduction of atmospheric emissions is a necessary condition for the fulfillment of the Sustainable Development Goals (SDGs). Within this framework, technological advances have moved toward finding a substitute for oil, which is currently the main source of energy worldwide.

The country's strategy is receiving international attention and support. Uruguay was selected by the United Nations as a beneficiary of a US$ 10 million non-reimbursable fund to meet decarbonization goals. The Uruguayan proposal was selected among several by the UN Joint SDG Fund and the program will create a

Renewable Energy Innovation Fund (REIF) that will be used to support the alignment of private investments with the SDGs through the establishment of a national ecosystem for impact investment.

Uruguay is working on several fronts to become CO2 neutral as quickly as possible. The second stage of the energy transition is led by the MIEM, UTE and ANCAP, seeking to create an efficient institutional framework for the incorporation of private investment projects. The clearest priority is the implementation of electric mobility for domestic routes and the incorporation of hydrogen in our productive sector for use (initially) as a substitute for heavy transport fuel. The transportation sector is the largest contributor to the country's carbon emissions.

GRAPH N°6 - PERCENTAGE OF CO2 EMISSIONS BY SECTOR IN 2020



Source: MIEM

The Uruguayan Association of Renewable Energies (AUDER) convened the seventh edition of the LATAM Renewables Congress[11] in September 2021[12] and brought together the main governmental, social, and business actors (both public and private) in the energy world.

The meeting demonstrated that the conversion to green energy requires a joint effort involving all of the actors in the energy sector: those linked to clean energies and those linked to fossil fuels. In other words, in order to reach carbon neutrality, the hydrocarbon and electricity markets need to combine efforts and processes to achieve production from renewable sources.

[11] LATAM Renewables Congress (link).
[12] Congress presentations (link).

The importance of regulation at the national and international levels was also highlighted as a necessary condition to manage the energy transformation and, in particular, to incorporate hydrogen into the energy matrix. On the one hand, the incentives offered by the regulatory framework will be relevant for investment traction. On the other hand, as the world moves toward green energy and the supply of this energy increases, certifications that guarantee that energy production did not generate carbon or greenhouse gas emissions will become crucial. These certifications will play a leading role in the international energy market as well as in an international capital market with a sustainable footprint.

In January 2022, the Renewable Energy Certificates system (CERs, by its initials in Spanish) was put into operation. This is an accreditation mechanism with an electronic format that ensures that certain number of megawatt-hours of electric energy, produced in a given period, is derived from renewable sources[13]. The MIEM has established the conditions for the issuance of CERs, in accordance with the principles of traceability, immutability, transparency and publicity. UTE developed a technological platform based on Blockchain technology, which allows the implementation and administration of the system. Through this system it will be possible to generate monthly certificates that allow detailing the distribution by source of energy consumed, based on hourly records.

The CERs, once issued, are automatically transferred to the distributor, marketer or large consumer that acquires the electric energy associated to the CER of the same calendar month. Customers with large or medium consumer tariffs may directly request the transfer of the CERs associated to their consumption. For such purposes, they may enter their request through the page of the Renewable Energy Certification System. For the rest of the distributor's customers with non-residential tariffs, this possibility will be enabled as of June 2022.

The country's geography, the favorable regulatory framework for investment, an energy policy with clear objectives, and the commitment of authorities and the political system to continually advance in the incorporation of renewable energies in the energy matrix ensure the continuity of significant investment opportunities in the medium and long term.

[13] Uruguay will recognize production from renewable sources with a certification system – MIEM **(link)**

3.1. OPPORTUNITIES ASSOCIATED WITH RENEWABLE ENERGIES.

3.1.1. GREEN HYDROGEN: A NATURAL STEP FOR URUGUAY TOWARDS DECARBONIZATION

Uruguay has completed the first stage of its energy transformation with the decarbonization of electrical generation, achieving an average share of renewables in the electricity matrix of 97% in the period between 2017 and 2020.

The second stage of the energy transition includes several challenges, including the decarbonization of the rest of the energy sector and raw material markets, as well as the development of a hydrogen-based economy for both local consumption and export industries.

In June 2021, Uruguay launched the Green Hydrogen Country Strategy.[14]. Hydrogen produced from renewable sources, called green hydrogen, plays a key role in the decarbonization of the energy and raw materials sectors.

What is green hydrogen?

Hydrogen is the first element in the periodic table and the lightest chemical element. Its atom consists of one proton and one electron and is stable in the form of a diatomic molecule (H_2), although it is not found naturally on the planet as this molecule but as a part of compounds, since it reacts easily with other chemical elements to form water, salts, hydrides, acids, methane, ammonia, polymers, etc. Since it is necessary to use energy to produce hydrogen, it is not a primary source of energy, but an energy vector, i.e. a way of storing and transporting energy.

Depending on the primary energy used in its production, hydrogen is categorized with a "color". If it is produced from fossil fuels, such as natural gas and coal, it is gray hydrogen. This is the most common form of production today, which generates greenhouse emissions in the process. Blue hydrogen is obtained in a similar way to gray hydrogen, yet carbon capture technologies are applied that significantly reduce emissions. Green hydrogen is produced with electrical energy from renewable sources – without fossil fuels – through a process called "water electrolysis", obtaining the hydrogen (H2) and oxygen (O2) molecules separately.

Its use, either for direct combustion or in a fuel cell to generate electricity, produces water vapor as the only emission, thus closing the cycle of a sustainable process.

[14] Green Hydrogen Country Strategy (link)

Uses and advantages of green hydrogen

Hydrogen is a storable and transportable energy carrier.

Green hydrogen can replace fossil fuels currently used in land, sea, or air transportation – either in combustion engines (using hydrogen, ammonia, methanol, synthetic fuels, etc.) or in fuel cell-powered electric engines.

There is a global consensus that hydrogen should be used mainly in heavy and energy-intensive vehicles and machinery, such as trucks, buses, and agricultural machinery – in addition to use as clean industrial fuel for the decarbonization of steel production and raw material manufacturing such as ammonia and methanol. It can also replace part of the natural gas for residential, commercial, and industrial uses both as H2 and synthetic methane.

Hydrogen is a key element for regional and international trade in renewable energy, enabling energy transportation between areas with favorable natural resources and low demand and those with high demand and lower energy production potential.

Hydrogen can be used to store large amounts of electrical energy for long periods of time, helping to manage the variability of renewable sources.

While the advantages of hydrogen make it a crucial enabler for global decarbonization, green and blue hydrogen technologies (such as electrolyzers, fuel cells, carbon capture, etc.) have not yet scaled up sufficiently, resulting in associated costs that are still high when compared to gray hydrogen production.

There is a worldwide effort to convert energy consumption to renewable sources, with market players assessing the costs of hydrogen production in different countries. At the financing level, banks and investor groups are giving increasing priority to sustainable investments in order to finance such projects.

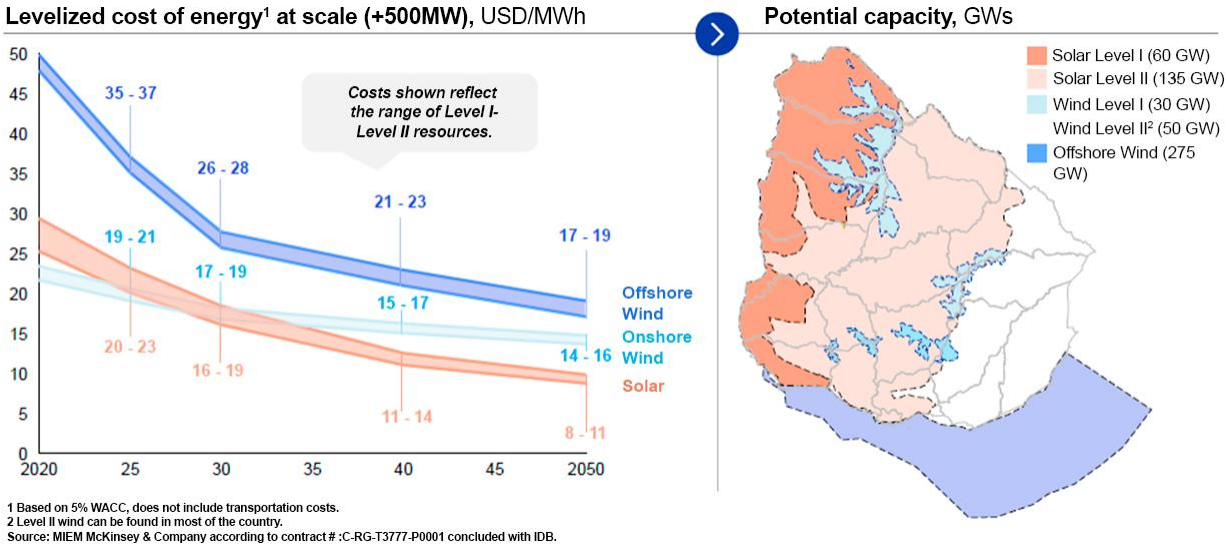
Why Uruguay? [15]

Uruguay has followed a successful path with its energy policy: transforming its electricity generation matrix toward renewable sources, in addition to increasing production and becoming a net energy exporter in the region. This change occurred alongside a long-term state policy and an adequate institutional and regulatory framework, which was adapted as the transformation advanced along the learning curve. The design and fulfillment of public-private collaboration opportunities allowed for a remarkable transformation in the country's energy supply. In addition, six more attributes position Uruguay as an attractive country for green hydrogen and derivative exports.

High Renewable Energy Generation Potential and Resource Complementarity

Uruguay has extremely promising wind and solar resources with a competitive levelized cost of electricity (LCOE). Given the country's low population density (20 inhabitants/km2), solar and wind generation projects can be installed throughout the nation. In fact, considering only the sites with the largest wind and solar potential, in excess of 90 GWs can still be installed, allowing for green hydrogen production at scale.

FIGURE 1 - LEVELIZED COST OF ENERGY AT SCALE AND POTENTIAL CAPACITY OF URUGUAY



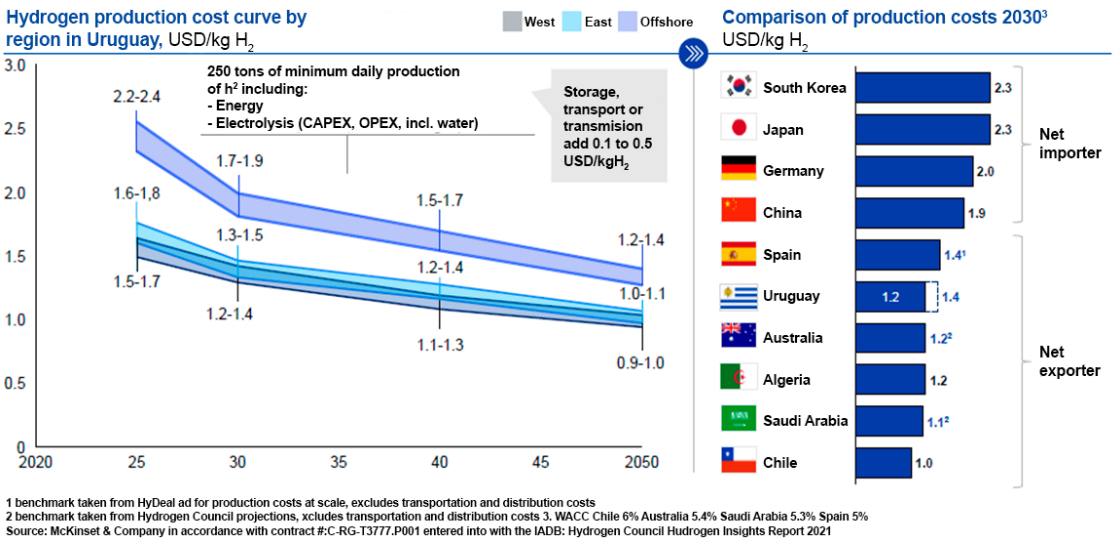
1 Based on 5% WACC, does not include transportation costs.
2 Level II wind can be found in most of the country.
Source: MIEM McKinsey & Company according to contract # :C-RG-T3777-P0001 concluded with IDB.

Additional opportunities exist for offshore renewable energy generation (across 208,057 km2 of surface area) with an estimated fixed offshore wind potential of 190 GW and 85 more GW of floating potential (World Bank, 2020).

[15] Results of the pre-feasibility study (link)

Uruguay's climate allows for daily and seasonal complementarity between wind and solar energy, meaning that hybrid wind/solar PV plants used to produce green hydrogen are expected to achieve high production capacity and hydrogen cost factors of up to 1.2 USD/kg by 2030. This places Uruguay among the most competitive countries for exporting green hydrogen and derivatives.

FIGURE 2 - PRODUCTION COST CURVE FOR HYDROGEN AND INTERNATIONAL COMPARISON

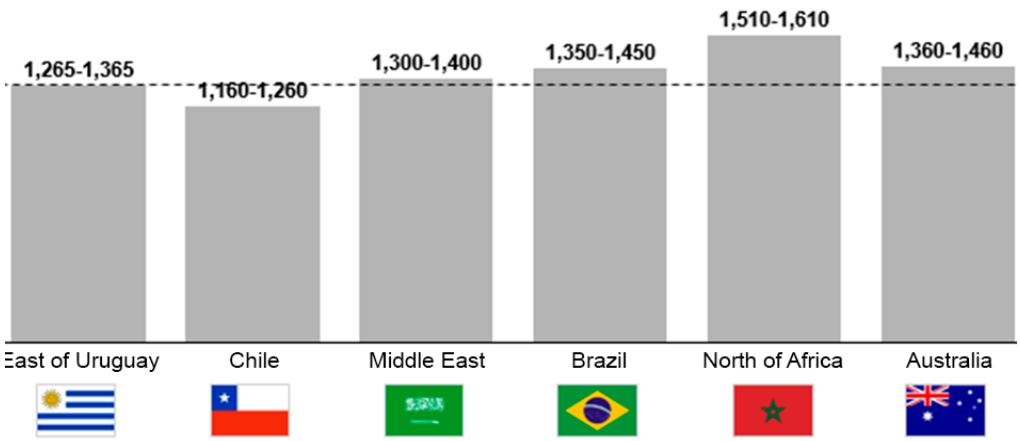


1 benchmark taken from HyDeal ad for production costs at scale, excludes transportation and distribution costs
2 benchmark taken from Hydrogen Council projections, xcludes transportation and distribution costs 3. WACC Chile 6% Australia 5.4% Saudi Arabia 5.3% Spain 5%
Source: McKinset & Company in accordance with contract #:C-RG-T3777.P001 entered into with the IADB: Hydrogen Council Hudrogen Insights Report 2021

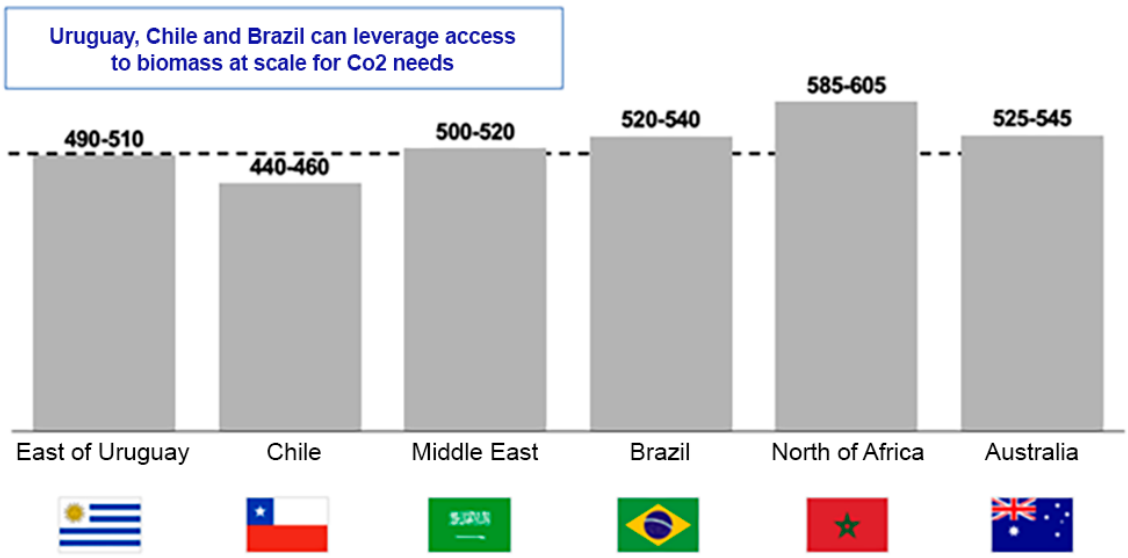
High CO2/biomass and water availability.

Uruguay also has the available biomass and associated industries to provide the renewable CO2 needed to produce Synfuels and other derivatives. Using renewable energy and biomass affords a competitive cost structure for products that require hydrogen and biogenic CO2, such as methanol and jet fuels.

GRAPH 7: JET FUEL PRODUCTION COST VS. COMPETITORS. (US$/TON OF FUEL PER INJECTION; YEAR 2030).



GRAPH 8: METHANOL PRODUCTION COST VS. COMPETITORS FOR PRIORITIZED COUNTRIES.
(US$/TON OF MEOH; YEAR 2030).



Source: McKinsey & company in accordance with contract # :C-Rg-T3777-P001 concluded with the IADB.

Uruguay also has abundant water resources distributed across the nation. Average rainfall in the country is 1,310 mm per year[16].

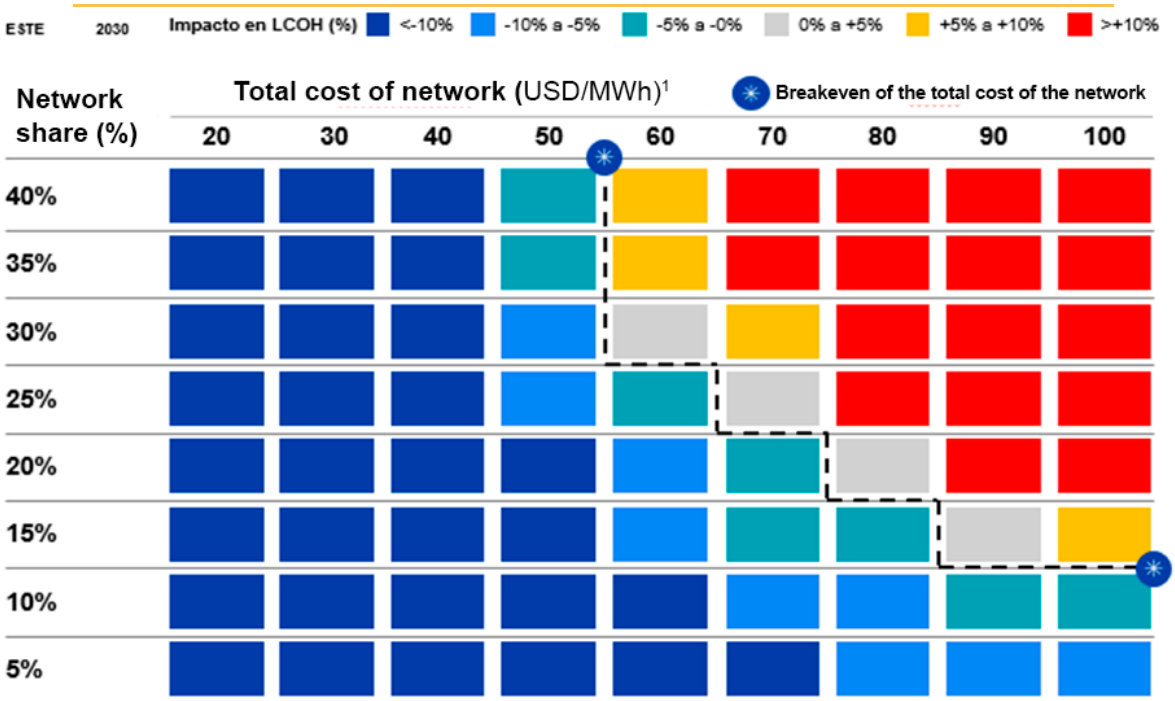
Renewable electricity matrix

Over the last four years (2017-2020), 97% of the electricity generated in Uruguay came from renewable energy. For industrial processes that need to operate continuously (e.g. Fischer Tropsch), connection to the electricity grid (National Interconnected System) positively impacts the profitability of the investments required for green hydrogen and derivative production (wind and solar photovoltaic plants complemented with hydrogen storage).

The following graph shows the impact on the cost of hydrogen for the production of jet fuels with the participation of grid electricity. For example, if the cost of grid power is USD 50/MWh and the share of grid power is 30% of the total energy used to produce hydrogen, the cost of hydrogen decreases by 5-10% compared to an investment solely from dedicated off-grid wind and solar PV with hydrogen storage.

[16] Source: National Hydrometric Data Bank, Water Information System, Dinagua 2019.

FIGURE 9: JET FUEL SYNFUEL: THE BUSINESS CASE FOR JET FUEL SYNFUEL IS MORE POSITIVE GIVEN THE STABILITY REQUIREMENTS OF THE PRODUCTION PROCESS.



1 Including energy, connection and transport costs. Does not include curtailment sold to the grid. Source:
Source: McKinsey & company in accordance with contract # :C-Rg-T3777-P001 concluded with the IADB.

The high share of renewable energy in the nation's electricity matrix has positioned Uruguay as a key player in the global energy transition[17], ranking 13th in the Energy Transition Index[18] and leading the region in renewable energy production.

Logistics

Uruguay has access to the Atlantic Ocean, allowing for the export of hydrogen and derivatives with shorter shipping distances and reduced transportation costs to Europe and the United States.

The country has no major geographical barriers, in addition to adequate infrastructure and access routes throughout the country for local transportation of hydrogen and its derivatives. A freight train connects to the port of Montevideo and a network of river and road transportation mechanisms can help improve competitiveness for exports.

Considering the country's advantages, MIEM technicians worked with technicians from the Port of Rotterdam and – with the support of UTE and ANCAP – carried out a pre-feasibility study on hydrogen production in

[17] Bertram, Rebecca: Uruguay, champion of renewable energy in Latin America -2020 (link)
[18] WEF - Fostering Effective Energy Transition, 2021 edition (link)

Uruguay in 2030, considering the entire chain up the export process. The costs of hydrogen production, storage, and transportation were estimated, considering different means of transportation. The results show costs potentially close to US$ 2.3 per kg, a globally competitive value.

Political, institutional and legal stability

Uruguay is a full, functioning democracy[19] with good socio-political stability, ranked sixth in the world for the civil and political liberties enjoyed by its people[20] and leading the region with a low perception of corruption[21] and a high rule of law index[22]. It has made considerable progress in the digitization of the public sector, ranking 26th in the e-Government Development Index and first in the region[23]. In addition, Uruguay has an investment grade credit rating[24].

The country boasts decades of renewable development experience, solid regulatory frameworks, political stability, and the necessary macroeconomic soundness for the development of hydrogen projects at scale, favoring the interests of private sector participants and lower capital costs.

Government commitment

- The government of Uruguay is advancing in the promotion of a green hydrogen ecosystem through the development of a national strategy, to be presented in the first months of 2022.
- The government will also support a pilot project associated with the use of hydrogen in heavy transport, to be carried out through private sector investments. The call for proposals will be made in early 2022.
- There are also fiscal incentives for the development of large-scale projects for the production of green hydrogen and its derivatives.

Based on these actions, the government is also making progress in regulatory aspects – formalizing the country's interest in the field, attracting the participation of private actors, and deepening local knowledge about the technology, production, and logistics while developing local capabilities.

[19] Economist Intelligence Unit: Democracy Index 2020: In sickness and in health?, 2021 (link)
[20] Freedom House: Global Freedom, 2021 (link)
[21] Transparency International: Corruption Perception Index (2020), 2021 (link)
[22] World Justice Project: Rule of Law Index (2020), 2021 (link)
[23] United Nations: Data Center, 2021 (link)
[24] MEF - Credit Rating (link)

H2U Pilot Project

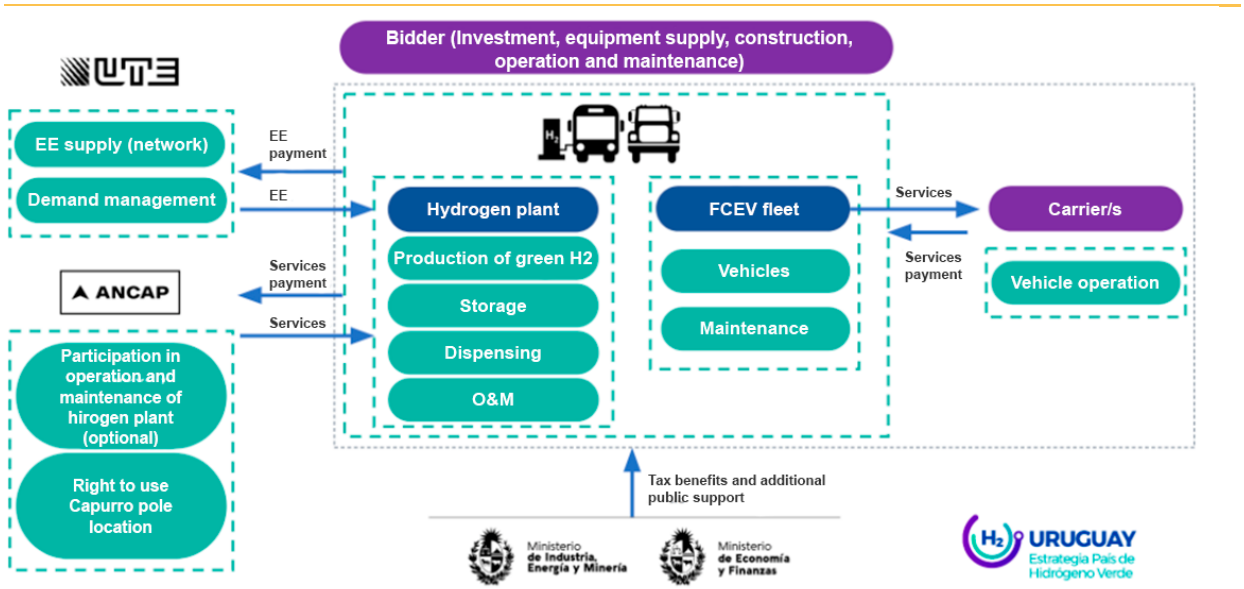
This is the first green hydrogen pilot program to operate in Uruguay, based on the articulation of public support - the Ministry of Industry, Energy and Mining, the Ministry of Economy and Finance, Ancap and UTE - and private investment. The Uruguayan government plans to have an articulating and supporting role in the project, but will work together with the private sector to design business models that are competitive, scalable, and economically self-sustainable.

The first stage of the H2U project is aimed at exchanging information with interested companies to facilitate the creation of guidelines for a competitive proposal process. A data room (virtual room that houses data and information) was set up to present the general project idea and promote feedback from different actors involved in the field regarding possible improvements to be made in the project.

Interested companies may present proposals under two categories: one focused on heavy transport and another open to other uses of green hydrogen (such as the production of green ammonia for fertilizers). The characteristics and requirements for both project modalities can be found in the data room of the H2U pilot project[25].

The Green Hydrogen Transport Pilot Project, the category linked to heavy transport, has a defined framework.

FIGURE 3 - INITIAL H2U PILOT BUSINESS MODEL FOR HEAVY TRANSPORT



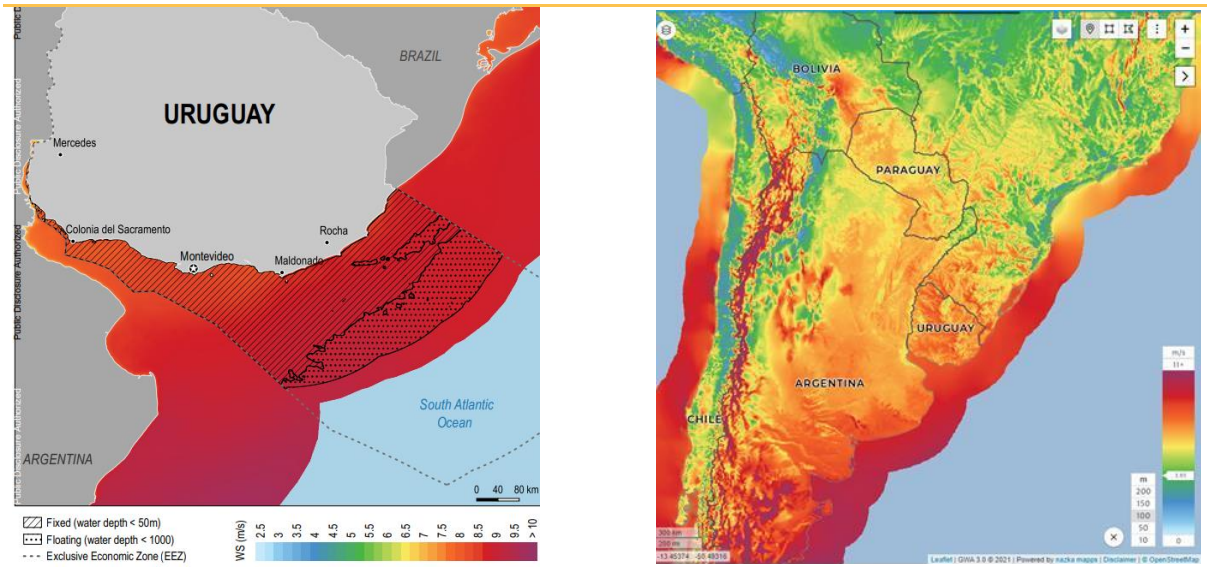
[25] Project Description, data room of the H2U pilot project (link)

The pilot project foresees a competitive bidding process by private companies interested in providing a solution. This group of companies is referred to as the "bidder" in Figure 2, where the initial business model for this modality is presented. The bidder will come from the private sector and will be responsible for the assembly and use of the hydrogen plant, in addition to supplying the vehicle transportation fleet (trucks and buses) and having settled the hydrogen demand (i.e. with contracts for vehicle use with the carriers). UTE will provide the renewable energy and ANCAP will grant use rights in its Capurro industrial park to install the plant. In addition, further state support would include tax benefits under the Investment Law. The project is projected to last 10 years.

H2U Offshore

In October 2021 ANCAP presented the H2U Offshore initiative[26], aiming to advance the production of hydrogen from offshore wind energy for large-scale export, aligned with the third stage of the country's hydrogen strategy.

FIGURE 4 - OFFSHORE WIND ENERGY POTENTIAL IN URUGUAY



Source: World Bank (link)

Uruguay's offshore wind sector attracts strong global interest, with considerable potential and high wind speeds and capacity factors, making it very attractive for the production of green hydrogen and derivatives for export.

[26] H_2U Offshore (link).

This is a medium and long-term proposal to attract private investment through incentives – without investment requirements or risk for the State, although ANCAP exercises an active role as State agent, taking advantage of its previous, successful experience in oil and gas rounds and accumulated knowledge in the areas of offshore exploration, maritime operations, geological and reservoir engineering, and round and contract negotiation with leading international oil and gas companies.

3.1.2. ELECTRIC MOBILITY

In Uruguay, the transportation sector is the main consumer of petroleum derivatives and the second largest consumer of energy after the industrial sector. Electric mobility means reducing polluting gas emissions, noise pollution, and advancing in energy sovereignty through the transportation sector. The objective is to electrify urban public transport, as well as corporate and application fleets, while promoting electrification among private vehicle owners.

In terms of infrastructure, Uruguay is a pioneer in the region. The country has the first electric road in Latin America, with 53 recharging points[27]. Furthering electrification efforts, MIEM develops the MOVÉS project for battery-electric vehicles[28].

In parallel, the electric vehicle market is gaining momentum: 100 vehicles were sold in 2020 and in the first four months of 2021, with sales exceeding 130 units[29].

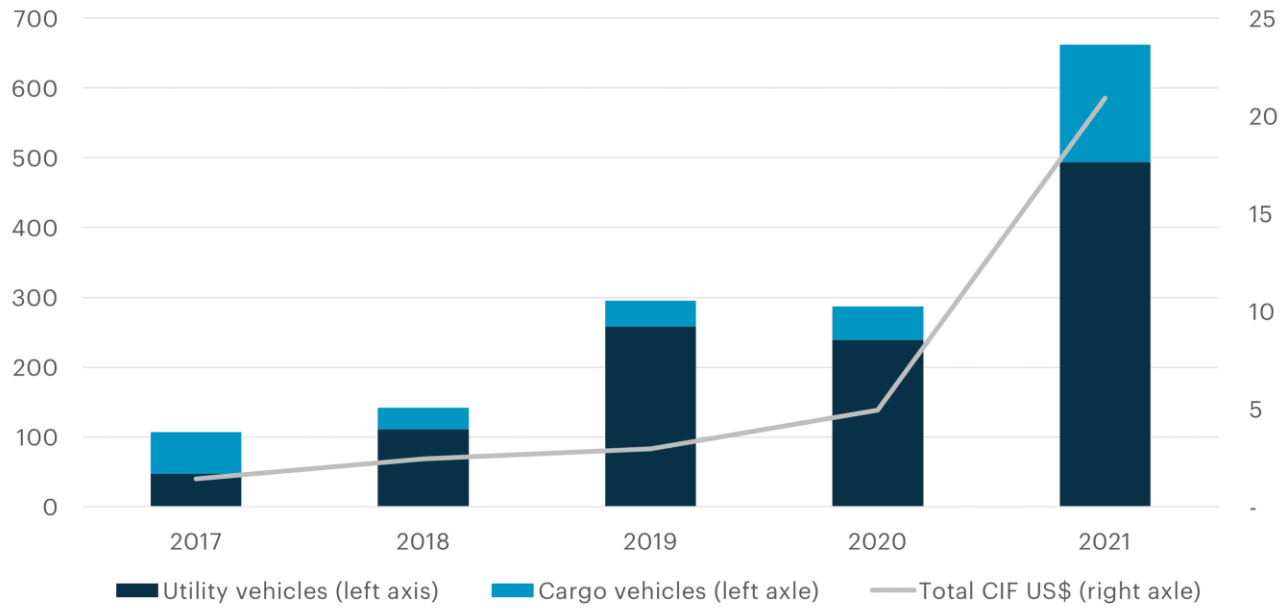
Imports of electric vehicles, including purchases made by various public agencies and companies, also point to greater dynamism. Between January and October 2021, 646 vehicles were imported, for a total value of US$ 21 million, as compared to a value of US$ 3.1 million for the same period of 2020.

[27] Load - UTE

[28] Among the incentives for electric vehicles promoted since 2010 are the reduction of the Internal Specific Tax (IMESI) applicable to hybrid and electric vehicles, the incorporation of electric utility vehicles rewarded under the Cleaner Production indicator in the Investment Promotion Law, and the modification of the Global Tariff Rate for cars with an exclusively electric propulsion engine, set at 0%.

[29] The electrical vehicle market heats up in Uruguay – La Diaria.

GRAPH 10 - IMPORTS OF ELECTRIC VEHICLES[30]



Prepared by Uruguay XXI based on Customs data

Uruguay's strong track record in electric mobility and clean energy production lead to the country being chosen by Volkswagen to launch its electrification strategy in Latin America[31]. Uruguay received the first ten units of the e-up! model, 100% electric vehicles that were tested and inspected in the country. In addition to the availability of energy and charging infrastructure, one of deciding factors that lead Volkswagen to choose Uruguay was the nation's technological infrastructure and connectivity, allowing for the management of data generated by the electric vehicles through permanent connectivity[32].

On September 16 at the Latam Renovables Congress, the mayor of Montevideo announced a plan to create two electric bus corridors, pending approval by the Executive Branch. If approved, the corridors would be implemented with two Bus Rapid Transit (BRT) or metrobus lines and 150 articulated electric buses would be acquired.[33]

Electric vehicles currently represent a tiny percentage of the total vehicle fleet in Uruguay: 30,000 cars are sold annually and 2021 estimates project only 1% of sales to be electric. If hybrid cars are also considered, sales figures reach 3,000 units per year – representing 10% of total sales.

[30] NCM 870380 and 870490.
[31] After Seven Years, Why VW Chose Uruguay as the regional beachhead for its 100% Electric Initiative – El Observador.
[32] For more information see the Uruguayan IT Sector Report.
[33] Two Electric Bus Corridors: Montevideo's Municipal plan to Improve Public Transportation – La Diaria.

The State continues to make progress in improving infrastructure for electric mobility and is currently installing fast charging points to provide users with added convenience[34]. A number of incentiveVSs for electric mobility also exist[35].

3.1.3. WIND FARMS

The policy of incorporating wind energy as a renewable and competitive energy source has been very successful for Uruguay. Prior to 2008, there were no large-scale wind farms in the country. There are currently a total of 41 wind farms in operation with an installed capacity of 1,506 MW[36]. This large investment was made possible thanks to a varied menu of business models.

Regarding the development of medium-scale wind farms, Uruguay has allowed its subscribers to generate their own electricity from any energy source since 2014, without affecting the producer's subscriber status. This framework places no limitations on the voltage of electric grid connections and does not enable the injection of electric energy into the national electric grid[37]. Under such arrangements, 9.1 MW of wind power has been installed as of 2020.

In the specific case of wind farms financed by the domestic capital market, participation in the financial trusts structured for the Pampa and Arias wind farms demonstrated retail and institutional investor eagerness to include these instruments in their investment portfolio.

3.1.4. SOLAR PARKS

The use of solar energy conversion technology has undergone significant development in the country. To date, there are 19 large-scale photovoltaic plants feeding their energy into the electric grid, with a total capacity of around 229 MW. The plants range from a few MW of installed capacity to 50 MW (in plants such as "La Jacinta" or "El Naranjal", installed in the area of Salto, in the country's northwest). In addition, small-scale, grid-connected PV generation increased from 0.04 MW in 2011 to 30MW in November 2021.

PV capacity was also expanded under off-grid generation. In this area, installed solar PV power as of 2020 was 5 MW.

[34] La Diaria interview with the Director of the National Energy Directorate, September-2021 (link)
[35] Electric Mobility Incentives UTE (link)
[36] Totals do not include microgeneration facilities or subscribers with generation.
[37] For more information see: (subscribers with non-injectable generation).

3.1.5. BIOENERGY PLANTS

The development of energy production from non-traditional biomass occurred in parallel to the growth of forestry, pulp, and agricultural production industries such as soybeans, rice and wheat – under the protection of an institutional framework for the development of instruments and incentives for the use of biomass by-products from forestry and other chains in energy production.

The main raw materials used to generate energy from biomass (heat and electricity) are: black liquor, forest residues, firewood, bagasse, rice husks, residues from the wool and dairy industries, and urban solid waste. Existing bioenergy plants in the country represent 9% of installed capacity (425 MW). By 2023, this figure is expected to increase with the beginning of operations by a new pulp mill, which will generate a firm, predictable, and renewable energy surplus of more than 150 MW – to be fed into UTE's power grid[38].

Today, the low price of electrical generation from other renewable sources is the key challenge for the development of new bioenergy plants in the country. As a result, new bioenergy projects are likely to emerge as part of other industrial processes in integrated complexes (biorefineries).

Other alternatives for bioenergy development include the generation of advanced fuels (renewable diesel, green hydrogen, methanol, renewable natural gas, aviation and marine biofuels), as well as solid biofuels (pellets).

3.1.6. WASTE THERMOVALORIZATION PLANT

The recovery of urban waste through its transformation into energy is one of the explicit objectives of the nation's energy policy and one of the pillars of the National Waste Management Plan, which proposes the efficient management and recovery of said wastes[39].

According to a study carried out by the National Environmental Directorate (DINAMA), the Montevideo Metropolitan Area, with more than 1 million tons of solid waste generated annually, would be the most attractive for the installation of a large-scale plant to generate energy from the thermal treatment of waste.

Possibilities also exist for projects recovering urban waste from all over the country or regional partnerships that would consolidate waste from several departments to transform into energy.

[38] More information (link)
[39] National Waste Management Plan (link)

Nonetheless, using globally-available technology, smaller volumes (e.g. 100-150 tons/day) can now be managed profitably as an energy source, making the installation of smaller plants in the country's interior more feasible.

3.1.7. ENERGY EFFICIENCY

As a complement to changes in the energy matrix, local authorities are implementing the National Energy Efficiency Plan[40]. This plan includes the promotion of measures conducive to an economically convenient reduction in the amount of energy required to produce a product or service while ensuring equal or higher levels of quality. The plan also contemplates the substitution of traditional energy sources for non-conventional renewable energy sources.

To meet these objectives, the plan provides financing, guaranteed investment projects, and/or technical assistance in Energy Efficiency (EE) across the public and private sector. For this purpose, different economic and financial promotion instruments are available.

3.1.8. INTELLIGENT NETWORK

As different energy sources are incorporated, the management of the electric grid becomes increasingly complex, both for the purposes of generation and distribution. On the one hand, complementing different energy resources becomes necessary to take full advantage of capacity at the lowest possible cost. On the other hand, because consumption peaks – whether daily or yearly -- do not tend to coincide with the times of the most abundant and cheapest generation, optimizing consumption becomes equally necessary..

3.1.9. ENERGY STORAGE

In order to continue expanding generation capacity based on wind and solar (both non-dispatchable energy sources) in the long term, more complex forms of variability management will become necessary. One possible strategy is to achieve more dynamic exchanges with neighboring countries' systems (Argentina and Brazil), while another option is to implement energy storage mechanisms. The technologies available today are in the process of increasing efficiency rates and competitiveness (e.g. batteries) or are associated with high investment amounts and long construction periods (as is the case for dams and/or storage and pumping stations). In the future, however, these alternatives are expected to become technically and economically viable options for the country.

[40] National Energy Efficiency Plan (link)

Among the advantages of energy storage, the process allows the grid to shift available supply from one moment in time to another – reducing the need for backup thermal power plants in the system. In addition, if the storage is installed in a distributed way, the process allows for more efficient use of electrical networks. Nevertheless, storage is not a good option for the structural surplus of electric energy that Uruguay generates, given the country's almost 100% renewable matrix with an important hydroelectric contribution – characterized by high variability and the increasing participation of wind and solar energy.

In September 2021, the first energy storage system began operation. It is a 30 kW system with 12 lithium-ferro-phosphate batteries that accumulate 97 kWh. In Uruguay in 2020, the installation of storage systems was approved for UTE customers. Investments in this technology are also eligible for tax benefits from the Commission for the Application of the Investment Law (Comap).

4. ANNEXES

4.1. INFORMATION ON URUGUAY'S ENERGY SYSTEM

BEN
BALANCE ENERGÉTICO NACIONAL URUGUAY

The BEN collects and summarizes information related to energy production, transformation, and consumption. Its main objective is to provide inputs for research on the evolution of the country's energy system and different, relevant variables. It also provides information to all organizations, companies, and individuals involved in the energy planning process.

Link: BEN - MIEM

UTEi contains information on management, consumption, billing, and service status for the main company in Uruguay's Energy Sector. UTE is engaged in generation, transmission, distribution, and commercialization activities for electric energy, as well as providing advisory services and technical assistance in the field.

Link: UTEi

4.2. LEADING PRIVATE COMPANIES IN RENEWABLE ENERGY

The remarkable transformation of the sector was possible due to the close coordination between the public sector (calling for proposals, selecting and signing the long-term PPAs that allowed the financing and effective implementation of the projects) and the involvement of the private sector. Both domestic and foreign companies contributed to the development and implementation of new technologies. As a result, these companies - many of them SMEs - expanded their capabilities and now provide services to other countries of the region. Some of these players are listed in this section.

4.2.1. COMPANIES INVOLVED IN THE INSTALLATION OF WIND FARMS

The wind power generation sector is undoubtedly the one that has experienced the most notable development. The companies involved include large and small domestic and foreign firms that play multiple roles: wind farm owners, financiers, project developers, consultants, manufacturers, importers and service providers.

Many of these players are part of the Uruguayan Association of Renewable Energies (AUDER, by its initials in Spanish), an organization that brings together companies in the sector and promotes the use of renewable energies and battery and hydrogen electric transport.

In the following link you can find an extensive list of players elaborated by the DNE.

4.2.2. COMPANIES INVOLVED IN THE GENERATION OF ENERGY FROM BIOMASS

The UPM and Montes del Plata pulp mills are Uruguay's largest pulp mills. They have a combined processing capacity of 8 million m3 of eucalyptus wood per year. The plants are energetically self-sufficient, using the residues dissolved in the cooking liquor, and in some cases also wood waste, to generate electricity. They have a generating capacity of 160 MW and 180 MW each, which exceeds the company's own consumption, with the

surplus being sold to the grid. In addition, a new UPM plant is under construction in the department of Durazno. The new plant represents an investment of $ 2.7 billion and is expected to start operations in 2022.

Galofer S.A. is a consortium of five rice mills (Saman, Casarone, Coopar, Glencore, and Arrozal 33) that uses rice husks as fuel to generate renewable electricity in the department of Treinta y Tres. The investment amounted to nearly US$15 million and has the capacity to generate 14 MW through the processing of some 110,000 tons of rice husk (husk represents approximately 20% of the tonnage of rice produced).

Bioener S.A.'s objective is to generate electricity and steam from biomass from wood from sawmills in the Rivera area. The installed capacity is 12 MW. The steam is sold to Urufor S.A., a wood processing company, to be used in its drying processes, while the electricity is supplied to the national power grid through sales to the state-owned UTE. The plant is located in the department of Rivera, which allows it to be close to the biomass generation area, as well as to the sawmill where the steam generated is used.

The mechanical wood processing company Weyerhaeuser built an energy cogeneration plant that uses the by-products of industrial wood processing. Its generation capacity is 12 MW, with the plant's consumption needs being between 5 MW and 6 MW. When the generation exceeds the energy consumed, the surplus is sold to the state electricity distribution company. This plant is now owned by BTG Pactual's Timberland Investment Group (TIG) which in June 2017 acquired all of Weyerhaeuser's assets in Uruguay.

Energía Renovable Tacuarembó (Fenirol S.A.) generates electricity from forestry waste and rice husks, being owned by four business groups from diverse backgrounds: Conatel (electrical appliances), Tsakos (shipyards), Zenda (tannery) and Secco (meat packing plant). The company was awarded one of the tenders for up to a total of 10 MW, which it is feeding into the power grid.

The company Ponlar S.A., located in Rivera, uses by-products from a neighboring sawmill to feed a steam boiler. Part of the steam is used to supply the sawmill's thermal demand and part to generate electricity in a 7.5 MW turbine.

Liderdat S.A., a joint venture of Azucarlito and other investment groups, produces electricity for the sugar industry from steam generated by burning chips and sawdust. The industrial plant operates 90 days a year, and the rest of the energy generated is sold on the SPOT market.

The company ALUR, 94% owned by ANCAP and 6% by the Venezuelan PDVSA, with three plants in operation throughout the country (Bella Unión, Paysandú, Capurro) produced 47,923 m3 of biodiesel and some 80,375 m3 of bioethanol. The Agrofuels Law (Law No. 18,195) establishes that they must be blended in a proportion of at least 5% in the substitution of diesel and gasoline. It also participates in the electricity market by selling

energy generated from bagasse, chips and eucalyptus sawdust in a cogeneration plant in Bella Unión with a capacity of 10 MWh.

Lanas Trinidad S.A., located in Flores, produces wool. It has a 0.6 MW biogas-fired power plant.

4.2.3. COMPANIES IN THE SOLAR POWER GENERATION SECTOR

The companies involved include large and small domestic and foreign firms that play multiple roles: farm owners, financiers, project developers, consultants, manufacturers, importers and various service providers.

Many of these players are part of the Uruguayan Renewable Energy Association (AUDER), an organization that brings together companies in the sector and promotes the use of renewable energy and electric transportation.

4.2.4. CONSTRUCTION OF TRANSMISSION LINES

In September 2019, a high voltage (500 kV) power transmission line between Melo and Tacuarembó was inaugurated[41]. This project was carried out through an operating lease with the Italian company Terna SpA. UTE will use and maintain the line under an operating lease. Most of the project will be financed by the IDB and the China Cofinancing Fund for Latin America and the Caribbean.

In addition, a 500 kV high voltage line will be built between Tacuarembó and Salto (Tacuarembó - Chamberlain - Salto), downstream of UPM's new pulp mill, which will allow the mill to supply itself with energy until it starts producing its own energy (based on biomass) and then injecting significant surplus generation into the national grid. This project will close the electric ring, composed of the high voltage lines of Salto Grande - Montevideo, San Carlos - Melo (which provides access to the interconnection with Brazil) and Melo - Tacuarembó. The ring will allow for greater flexibility of the Uruguayan electricity system, being able to feed the grid from more than one starting point, as well as improving Uruguay's electricity export profile. The financing modality for this project is still under discussion (the options are public funds, a trust or operational leasing)[42].

[41] Más información
[42] Más información

4.3. INSTITUTIONAL AND REGULATORY FRAMEWORK

The success of the energy sector is partly due to the existence of an Energy Policy that charts a clear course and establishes a solid Institutional and a regulatory framework that is attractive to investors.

Uruguay's Energy Policy 2005-2030[43] has become a State policy transcending individual governments that establishes the main national and long-term guidelines for the energy field. It was approved by the Executive in 2008 and ratified by a Multiparty Energy Commission in the Parliament in 2010.

It is based on four elements:

- Strategic guidelines, which define the main conceptual axes of the energy policy.
- Goals to be achieved in the short (5 years), medium (10 to 15 years) and long (20 years and more) terms.
- The planned series of actions necessary to achieve these goals.
- Permanent analysis of the energy situation in the country, the region, and the world.

The Energy Policy is committed to the diversification of the energy matrix and the incorporation of local sources in general and renewable energies in particular. This commitment has several objectives, the most noteworthy of which are: achieving energy sovereignty, reducing costs, promoting the national energy industry, and reducing dependence on oil.

4.3.1. INSTITUTIONAL FRAMEWORK

Ministerio de Industria, Energía y Minería

Executing unit of the Ministry of Industry, Energy and Mining (MIEM), responsible for proposing and coordinating the national energy policy. Among its main duties are to coordinate and guide actors operating in the energy sector and to participate in the elaboration of the legal and regulatory frameworks for energy activities.

Website: www.miem.gub.uy/energia

[43] See more information: Energy Policy 2005-2030.

The *Administración Nacional de Usinas y Transmisiones Eléctricas* (UTE) is a state-owned company engaged in the generation, transmission, distribution, and commercialization of electricity. Although a spot energy market exists, the vast majority of private power generators sell their electricity to UTE.

Website: www.ute.com.uy

State-owned company that carries out various activities in the production, distribution, and marketing of fuels, alcohols, and portland cement. It operates in these markets through direct participation or as a shareholder (in many cases, the majority shareholder) or owner of several companies that operate across these business lines. In the area of energy, ANCAP's activities with natural gas and liquid fuels are especially noteworthy. With renewable energies, ANCAP is a majority shareholder in ALUR - a biofuels producer.

Website: www.ancap.com.uy

The sector's regulatory agency is the Energy and Water Services Regulatory Unit (URSEA), created as a decentralized agency of the Executive Branch, with authority over the electricity, gas, and hydrocarbon markets – in which the aforementioned public companies operate.

Website: www.ursea.gub.uy

The Electricity Market Administration is a non-governmental public entity that administers the Wholesale Electricity Market.

Website: www.adme.com.uy

The Commission for the Application of the Investment Law operates within the Ministry of Economics and Finance, tasked with promoting and protecting investments (both domestic and foreign) in Uruguay.

Website: http://comap.mef.gub.uy

The Uruguayan Association of Private Power Generators is a non-profit civil association that brings together most of the private power generators located in Uruguay with active contracts with UTE or connection agreements with the National Interconnected System (SIN). It is made up of 28 companies with more than 1,000 MW total installed capacity.

Website: www.augpee.org.uy

The Uruguayan Association of Renewable Energies is a civil association dedicated to promoting, supporting, and bringing together companies and individuals around issues and projects relevant to the use of renewable energies. It currently has close to 100 active members, including developers, suppliers, advisors, and logistics operators.

Website: https://www.auder.org.uy

Association that brings together solar energy companies operating in the country, including importers, manufacturers, and installation designers.

Website: www.camarasolardeluruguay.com.uy

Other institutions and programs

Wind energy program in Uruguay	www.energiaeolica.gub.uy
Solar energy program in Uruguay	www.energiasolar.gub.uy
Probio Project	www.dne.probio.gub.uy
Biovalor Project	www.biovalor.gub.uy
Energy Efficiency Plan	www.eficienciaenergetica.gub.uy
Ministry of Environment	www.gub.uy/ministerio-ambiente
Private Sector Support Unit (UNASEP)	www.mef.gub.uy/unasep
National Climate Change Response System	www.cambioclimatico.gub.uy
National Agency for Research and Innovation (ANII)	www.anii.gub.uy
Technological Laboratory of Uruguay (LATU)	www.latu.org.uy
Solar Laboratory (LES) - University of the Republic of Uruguay (*Universidad de la República*)	www.les.edu.uy
UTEC Uruguay - Engineering in Renewable Energies	www.urtec.edu.uy
Pando Technological Pole - R&D - Renewable Energies	www.polotecnologico.fq.edu.uy
Electric Mobility Board	www.moves.gub.uy

4.3.2. REGULATORY FRAMEWORK OF THE ELECTRICITY SYSTEM

The Energy and Water Services Regulatory Unit (URSEA) is the state institution that regulates, supervises, and advises on the generation, transmission, and distribution of electricity[44].

Law 16.832 of the Electrical Regulatory Framework, approved in June 1997, establishes the freedom to generate electricity for any public or private entity. On the other hand, it establishes that transmission and distribution (insofar as they are totally or partially destined to third parties on a regular or permanent basis) are managed by UTE, a State entity.

General investment promotion regime

Uruguay has had an active policy of promoting investments in the country for decades. Law 16.906 (1998) declares the promotion and protection of national and foreign investments of national interest. As a distinctive feature worth noting, foreign investors enjoy the same incentives as local investors. No discrimination exists in the area of taxes and there are no restrictions on the transfer of profits abroad. Decrees 455/007, 002/012, 143/018, and 268/020 govern these rules.

[44] View the complete overview of regulations governing the electricity sector (link).

Uruguay's investment promotion regime also provides the investor with tax benefits on corporate income and equity. Investment projects covered by this regime and promoted by the Executive may compute between 30% and 100% of the amount invested as part of their tax payment (for IRAE - Tax on Income from Economic Activities). The exempted tax may not exceed 90% of the tax payable[45]. The national fixed rate of IRAE is 25%. Wealth tax on movable fixed assets and public works may also be exempted.

Specific regimes for renewable energies

Uruguay has a regulatory framework designed to develop the renewable energy sector, increase private participation in electricity generation, and increase investments in energy.

Decree 268/2020[46] of Law 16.906 grants tax incentives to investment projects that are declared relevant by the Executive Branch. Among the projects the law seeks to promote are those with a verified contribution to the use of clean technologies. The law also promotes goals related to employment generation, decentralization, export promotion, increasing research, development, and innovation expenses(R&D&I), and several specific sectoral priorities.

Decree 354 of 2009[47] grants specific tax incentives for the renewable energy sector based on Article 11 of the Law for the Promotion and Protection of Investments.

Decree 23/014[48] establishes that investments in wind power generation projects destined for the national interconnected system are considered to be intangible assets as contemplated in Decree 02/012 at the moment the assets are transferred to UTE.

Solar Thermal Energy Law

The Solar Thermal Energy Promotion Law (Law 18.585 of 2009) declares research, development, and training in the use of solar thermal energy to be of national interest. Thus, investments in the manufacture, implementation, and effective use of solar energy are included in the activities eligible for the exemptions provided by Law 16.906, mentioned above. Additionally, the national executive has the authority to exempt and refund all or part of the Value Added Tax (VAT), Specific Internal Tax (IMESI), and customs taxes on solar collectors manufactured domestically or those imported that do not compete with local production – including any domestic or imported goods and services (that do not compete with local production) necessary for their

[45] For more information, see the Investor Guide.
[46] https://www.impo.com.uy/bases/decretos/268-2020
[47] https://www.impo.com.uy/bases/decretos/354-2009/1
[48] https://www.impo.com.uy/bases/decretos/23-2014/2

manufacture. Decree 451/011 regulates the benefits granted by the Law and authorizes the sale of equipment exempt from local VAT.

In addition, it seeks to promote the use of this technology across various sectors by mandating the incorporation of this technology in all new construction projects in high consumption sectors, such as hotels, health centers, and sports clubs.

Simultaneously, several UTE resolutions provide financing and benefits for the acquisition of solar collectors in certain housing cooperatives, allowing the user to enjoy between 15 and 20 years of net electricity savings. Together, these two measures may provide a strong incentive for those companies involved in the supply of inputs and equipment for solar generation.

Biofuels

Uruguay has a favorable regulatory framework for the production of biofuels, given that biodiesel and fuel alcohol production companies authorized by the Ministry of Industry, Energy, and Mining are eligible for an exemption from property tax on fixed assets, as well as a 100% exemption from income tax (IRAE, which in Uruguay is 25%) for a period of 10 years.

Law 19.924 (Article 316) extends the provisions of Law 18.195 (on Agrofuels) of November 14, 2007 – for fuel alcohol and biodiesel products – to all renewable liquid fuels obtained either from raw materials of agricultural origin or from the processing of industrial, agro-industrial, or solid urban waste. The provisions include the production, domestic marketing, and export of renewable liquid fuels with domestic or imported raw materials.

Law 19.996, approved in November 2021, in Articles 182 to 184, makes the following amendments to Law 18.195 on agrofuels:

- "Repeals article seven which mandated ANCAP to incorporate biodiesel (B100) produced in the country with domestic raw materials, in a minimum mandatory proportion of 5% over the total mixture volume for domestically sold automotive diesel oil.

- "Mandates ANCAP to incorporate fuel alcohol produced in the country with national raw materials, in a minimum proportion of 8.5% of the total mixture volume for automotive gasoline sold domestically.

As a result of these amendments, the obligation to blend biodiesel is eliminated while the minimum mandatory blend for fuel alcohol is increased from 5% to 8.5%. The amendments apply as of January 1, 2022.

Regulations: Law 17.567, Law 18.195, Law 19.289, Law 19.924, Decree 523/008 and Law 19.996.

Promotion of microgeneration

Although micro-generation first appeared in places lacking a connection to the traditional electrical grid, micro-generation solutions have, more recently, begun to be implemented as a complement to the grid.

Decree 173/010[49] authorizes subscribers connected to the low voltage distribution network to install wind, solar, biomass, or mini-hydro renewable generation, subject to certain requirements regarding the power installed.

The Decree entrusted the MIEM with the approval of the general conditions to be applied in the bidirectional exchanges between the micro generator and the distributor. Initially, the conditions established by the MIEM determined that UTE would buy all of the energy delivered to the grid at the same price stipulated in the tariff schedule. The Ministerial Resolution of May 12, 2017[50] established a requirement affecting the energy balance between the energy generated by the generating plant and the consumption of the micro-generating user in order to avoid the installation of projects not chiefly designed for self-consumption. The resolution applies to micro generation projects submitted after the date of the resolution.

Self-consumption of electricity

The generation of electricity for self-consumption without the possibility of injecting surpluses into the power grid -- including plants isolated from the grid or which, despite being connected, do not inject energy into the grid -- is regulated by Decrees 43/015 and 114/014. Said decrees establish that installed power of less than 150 kW does not require authorization from the MIEM, although prior registration is required. Those generating above this threshold will have to obtain specific authorization from the National Energy Directorate of the Ministry of Industry, Energy and Mining. If public waters are used, authorization for the use of water resources will also be required.

All generation plants must install a meter to record the energy produced, to be submitted monthly to the DNE for the purposes of calculating the energy balance. If public water resources are used, a water use concession will also be required.

[49] https://www.impo.com.uy/bases/decretos/173-2010
[50] May 12th 2017 Resolution, MIEM

Energy Efficiency

The National Energy Efficiency Plan is regulated by Law 18.597, approved in 2009. This law establishes the implementation and promotion of various efforts to foster energy efficiency, as well as the appropriate financial mechanisms for the promotion of efficient energy use in the country[51].

For more information on industry regulations, please click here: DNE-Guidelines

Benefits for electricity-intensive companies

As a way of taking advantage of the benefits of the local energy matrix for the consolidation of industrial development, UTE favors a special rate for electro-intensive companies. The last call for obtaining said benefit was made through Decree 118/017, which established an application period between May and June of 2017. To access the benefits offered, companies had to have an annual electricity expenditure with UTE greater than or equal to 2.5% of the annual Gross Production Value and have at least one year in operation. The benefit offered is tied to the maintenance or increase of physical production and consists of a monthly discount on energy consumed, without VAT.

In its first edition (2015-2016), the measure resulted in higher industrial production amounting to a gross production value of US$ 11 million for the 24 companies that applied – which also translated into jobs, turnover, taxes collected, and spillover to the national economy. In the 2017 edition, 92 electro-intensive industries applied.

Rate discounts for the productive sector

Generation costs have already been reduced through changes in the country's energy matrix and recent measures aim to transfer these savings to the productive sector.

In May 2017, UTE announced a commercial benefit program for dairy producers and companies or productive units involved in the dairy chain. The benefit consists of a monthly discount on the energy rate without VAT and involves four levels of support depending on the characteristics of the beneficiaries. The rate discounts were applied between June and December 2017.

Another noteworthy measure implemented was the pilot plan for the "Opportunity Buy" program, which offered multi-hour tariffs for companies. The UTE governs the mechanism by offering differentiated electrical rates at certain times with rebates of up to 40%, depending on the energy surplus available to the state-owned

[51] http://www.eficienciaenergetica.gub.uy/marco-legal

company. The special rate is applied to consumption above the user's average consumption, according to the specific time of day.

4.4. AVAILABLE RENEWABLE ENERGY SOURCES

Uruguay has natural resources that allow for the development of renewable energies. Heavy water flow, constant and predictable winds, uniform solar irradiation throughout the country (with some seasonal variation), and a thriving agro-industrial sector provide numerous opportunities in the energy sector.

What are renewable energies?

Renewable energy is energy that comes from virtually inexhaustible sources, either because of the immense amount of energy they contain or because they are capable of regenerating themselves naturally. The main sources of renewable energy include: solar energy, wind energy, hydraulic energy, tidal energy (which results from harnessing the energy of the tides), geothermal energy (obtained by harnessing the heat generated in the Earth's interior), and biomass. Renewable energies are defined as opposed to non-renewable energies, which are those that are found in nature in limited quantities.

4.4.1. HYDRO

Hydropower in Uruguay is the main source of electric energy. The hydraulic generating system is made up of three waterfall power plants on the Negro River: Gabriel Terra (Rincón del Bonete), with an installed capacity of 152 MW; Baygorria with 108 MW, and Constitución (Palmar) with 333 MW – in additon to a binational power plant on the Uruguay River (Salto Grande) with a capacity of 1890 MW, of which 945 MW correspond to Uruguay and the rest to Argentina. Salto Grande generated 63% of the country's hydroelectric power in 2020, while Palmar provided 20% and Gabriel Terra and Baygorria provided 10% and 8% respectively. Currently, large-scale hydropower use in Uruguay is close to a maximum limit. There is, however, additional capacity for the installation of small hydropower plants (SHPs) that could eventually become an additional source of supply.

4.4.2.WIND POWER

In recent years, wind energy has become more reliable and has entered the electricity systems of many countries. Uruguay is no stranger to international trends and has experienced a well-financed period of wind energy development allowing it to take advantage of the resource's enormous availability in Uruguay.

The country's topographic characteristics, with large plains and almost no obstacles, guarantee constant and predictable wind availability[52]. So far, development and expansion of wind generation capacity has all occurred onshore. The feasibility of installing offshore wind turbines, a well-developed technique in some northern European countries, has not yet been explored.

TABLE 2 - PRIVATE WIND POWER GENERATORS

GENERATOR	AGENT GENERATOR	PRIMARY SOURCE	INSTALLED POWER
PERALTA I GCEE	AGUA LEGUAS S.A.	Wind	58,75 MW
PERALTA II GCEE	AGUA LEGUAS S.A.	Wind	58,75 MW
TALAS DEL MACIEL I	ASTIDEY S.A.	Wind	50 MW
TALAS DEL MACIEL II	CADONAL S.A.	Wind	50 MW
CORFRISA	CORPORACIÓN FRIGORÍFICA DEL URUGUAY	Wind	1,8 MW
ENGRAW	ENGRAW EXPORT & IMPORT CO. S.A.	Wind	3,6 MW
MELOWIND	ESTRELLADA S.A.	Wind	50 MW
CARAPÉ I WIND FARM	FINGANO S.A.	Wind	51 MW
MINAS I	GENERACIÓN EÓLICA MINAS S.A. - GEMSA	Wind	42 MW
FLORIDA II WIND FARM	GLYMONT S.A.	Wind	49,5 MW
18 DE JULIO WIND FARM	IKEROL COMPANY S.A.	Wind	10 MW
JULIETA WIND FARM	IWERYL S.A.	Wind	3,6 MW
MAGDALENA WIND FARM	KENTILUX S.A.	Wind	17,2 MW
CERRO GRANDE WIND FARM	LADANER S.A.	Wind	50 MW
LUZ DE LOMA	LUZ DE LOMA S.A.	Wind	20 MW
LUZ DE MAR	LUZ DE MAR S.A.	Wind	18 MW
LUZ DE RÍO	LUZ DE RÍO S.A.	Wind	50 MW
MARYSTAY	MARYSTAY S.A.	Wind	2 MW
PALOMAS	NICEFIELD S.A.	Wind	70 MW
LOMA ALTA - CENTRAL 1 WIND FARM	NUEVO MANANTIAL S.A.	Wind	14 MW
NUEVO MANANTIAL CENTRAL 2	NUEVO MANANTIAL S.A.	Wind	4 MW
CUCHILLA DEL PERALTA I	PALMATIR S.A.	Wind	50 MW
KIYÚ WIND FARM	PARQUE EÓLICO KIYÚ S.A.	Wind	49,2 MW
FLORIDA I WIND FARM	POLESINE S.A.	Wind	50 MW
SOLÍS DE MATAOJOWIND FARM	POSADAS & VECINO S.A.	Wind	10 MW
MALDONADO II WIND FARM	R DEL ESTE S.A.	Wind	50 MW
MALDONADO WIND FARM	R DEL SUR S.A.	Wind	50 MW
VENTUS I WIND FARM	República Administradora de Fondos de Inversión S.A.	Wind	9 MW

[52] A survey conducted by the MIEM and the School of Engineering at the University of the Republic in 2009 has allowed for the creation of a national wind map. Wind Power program for Uruguay (PEEU)

VILLA RODRÍGUEZ WIND FARM	TOGELY COMPANY S.A.	Wind	10 MW
LIBERTAD WIND FARM	TOGELY COMPANY S.A.	Wind	7,7 MW
ROSARIO WIND FARM	TOGELY COMPANY S.A.	Wind	9 MW
MARÍA LUZ WIND FARM	TOGELY COMPANY S.A.	Wind	9,75 MW
CARAPÉ II WIND FARM	VENGANO S.A.	Wind	40 MW
NUEVO PASTORALE I WIND FARM	VIENTOS DE PASTORALE S.A.	Wind	52,8 MW

Source: Uruguay XXI based on UTE data.

4.4.3.SOLAR

Uruguay is located in a geographical latitude range from 30º 04' to 34º 53'. The annual average daily global irradiation on a horizontal plane over Uruguay is 4.6 kWh/m2. The Solar Energy Laboratory[53] (LES) at the *Universidad de la República* (UDELAR) offers very detailed geographic and temporal information about available solar resources.

Over the last few years, the installed capacity of large-scale photovoltaic energy parks (large, small, and medium scale) and small and medium scale installations (see table 3), have increased sharply. Solar thermal energy installations have also experienced significant recent development in Uruguay, increasing from an area of 50,000 m^2 in 2014 to almost 100,000 m2 (according to the National Energy Balance for 2020).

TABLE 3 - PRIVATE SOLAR POWER GENERATORS

GENERATOR	AGENT GENERATOR	PRIMARY SOURCE	INSTALLED POWER
ALTO CIELO	ALTO CIELO S.A.	Solar Photovoltaic	20 MW
CASALKO	CASALKO S.A.	Solar Photovoltaic	1,76 MW
TS	CERNERAL S.A.	Solar Photovoltaic	1 MW
EL NARANJAL	COLIDIM S.A.	Solar Photovoltaic	50 MW
DICANO	DICANO S.A.	Solar Photovoltaic	11,25 MW
FENIMA	FENIMA S.A.	Solar Photovoltaic	9,5 MW
ARAPEY SOLAR	GIACOTE S.A.	Solar Photovoltaic	10 MW
MENAFRA SOLAR	GIACOTE S.A.	Solar Photovoltaic	20 MW
ABRIL	GILPYN S.A.	Solar Photovoltaic	1 MW
LA JACINTA	JACINTA SOLAR FARM S.R.L.	Solar Photovoltaic	50 MW
DEL LITORAL	JOLIPARK S.A.	Solar Photovoltaic	16 MW

[53] Solar Energy Laboratory.

NATELU	NATELU S.A.	Solar Photovoltaic	9,5 MW
PETILCORAN	PETILCORAN S. A.	Solar Photovoltaic	9,5 MW
RADITON	RADITON S.A.	Solar Photovoltaic	8 MW
VINGANO	VINGANO S.A.	Solar Photovoltaic	1 MW
YARNEL	YARNEL S.A.	Solar Photovoltaic	9,5 MW

Source: Uruguay XXI based on UTE data.

4.4.4. BIOMASS

Biomass is described as "any organic matter that can be used for energy purposes". This concept includes products and by-products of woody and herbaceous origin, also including certain industrial and municipal wastes. In recent years, Uruguay has experienced significant changes in its agricultural sector, with a strong expansion in the production of crops such as soybeans, rice, and wheat. At the same time, forestry in Uruguay has undergone a significant expansion, reaching almost 1 million hectares of forested land, which has allowed for the development of mechanical wood processing industries. The development of energy production from non-traditional biomass occurred alongside the growth of the forestry sector – in addition to receiving extra momentum from a growing cellulose industry and a State Energy Policy that prioritizes the promotion of renewable energies. The advantages of biomass as an energy source are mainly associated with its simple manageability and its ability to act as a backup for the electrical grid.

TABLE 4 - PRIVATE BIOMASS GENERATORS

GENERATOR	AGENT GENERATOR	PRIMARY SOURCE	INSTALLED POWER
ALUR	ALCOHOLES DEL URUGUAY S.A.	Biomass	10 MW
BIOENER	BIOENER S.A.	Biomass	12 MW
MONTES DEL PLATA	CELULOSA Y ENERGIA PUNTA PEREIRA S.A.	Biomass	180 MW
FENIROL	FENIROL S.A.	Biomass	10 MW
GALOFER	GALOFER S.A.	Biomass	14 MW
ARBORETO	LANAS TRINIDAD S.A.	Biomass	0,6 MW
LIDERDAT	LIDERDAT S.A.	Biomass	5 MW
PONLAR	PONLAR S.A.	Biomass	7,5 MW
URUPLY	URUPLY S.A.	Biomass	12 MW
UPM	UPM	Biomass / Fuel Oil	161 MW

Source: Uruguay XXI based on UTE data.

Simultaneously, the national public sector has made considerable efforts to analyze the country's potential for biomass energy production. Examples of projects already completed include PROBIO and BIOVALOR.

4.4.5.FOREST RESIDUES

In recent years, electricity generation projects using forestry and agricultural residues have been installed throughout the country, promoted by bidding processes that favored investment. In Uruguay, a high percentage of wood produced is processed into other secondary products, creating enormous potential for repurposing by-products yielded by mechanical transformations in the wood industry.

Forest industry operations produce large amounts of waste through different processes, with much of the waste stream having potential uses in the production of different biochemical products, biomaterials, and advanced biofuels. Uruguay currently enjoys the status of a country with bioeconomy-oriented policies and is committed to diversified and transforming its forestry sector toward higher value-added production.

4.4.6. AGRICULTURAL-LIVESTOCK WASTE

There are currently several energy generation experiences working with agricultural residues, although it is estimated that these resources are currently underexploited. One of the first energy sources of this type explored in the country was rice husks, with two enterprises currently processing this waste stream and another dedicated to generating energy from sugar cane bagasse.

As for wastes generated by livestock activities, several projects producing biogas from anaerobic digestion are also active in the dairy and wool industries.

4.4.7.LIQUID BIOFUELS

Uruguay – as an important agricultural producer – offers the necessary conditions for the production of liquid fuels from biomass. Bioethanol and biodiesel production have increased in the last decade. In 2020, the biomass supply for the production of biofuels was 2% of total energy supply. These biofuels were generated exclusively from domestic raw materials, as indicated in the agrofuels law (Law 18.195).

ALUR S.A. (90.79% owned by ANCAP) is the country's main agrofuel producer. It has a Bioethanol production capacity of 92,200 m3/year, mainly sold to ANCAP to blend with gasoline in a percentage of approximately 10%. It also has an annual production capacity of 50,000 tons/year of biodiesel, which is mainly supplied to ANCAP for blending with diesel at a rate of approximately 5%. The company has also succeeded in exporting its products to international markets.

ANCAP currently oversees an initiative to take advantage of existing biomass resources in accordance with its obligations under article 67 of the Forestry Law (15.939). Along with Fundación Latitud de Latu (CIDEB), ANCAP created a research center for second generation biofuels from lignocellulosic residues. This center performs research projects aimed at identifying second-generation biofuels from lignocellulosic materials from forest crops, forest residues, or energy crops.

4.4.8.URBAN WASTE

The use of municipal solid waste (MSW) for the production of energy is a mechanism increasingly used worldwide as a way to mitigate the pollution generated by large urban centers. Uruguay does not have medium or large-scale plants for the transformation of urban waste into energy, apart from pilot plans carried out by some municipalities.

The treatment and final disposal of urban waste is the responsibility of each of the country's 19 municipalities. According to the different studies available, MSW disposed of in the main final disposal sites totals some 1,100,000 tons/year, of which 780,000 tons/year come from Montevideo.

National and departmental authorities consider waste valorization through energy production as a necessary action, are interested in developing this type of projects to cover several urban centers, and understand that there are opportunities for the entry of private actors.

The Waste Management Law was approved in September 2019[54]. The law is intended to be a regulatory instrument that frames and regulates waste management, with clear guidelines incorporated with environmental directives. The law is based on a sustainable development model, promoting the reuse of waste and betting on new forms of business and employment.

[54] Waste Management Law

5. URUGUAY IN BRIEF (2021)

URUGUAY IN FIGURES

OFFICIAL NAME	REPÚBLICA ORIENTAL DEL URUGUAY
Geographical location	South America, bordering Argentina and Brazil
Capital	Montevideo
Area	176,215 km2. 95% of the territory is productive land suitable for agriculture and livestock farming.
Population (2019)	3.52 million
Population growth (2019)	0.3% (annual)
GDP per capita (2020)	US$ 15,173
Currency	Uruguayan peso ($)
Literacy rate	0,98
Life expectancy at birth	77.6 years
Form of government	Democratic republic with presidential system
Political division	19 departments
Time zone	GMT - 03:00
Official language	Spanish

MAIN ECONOMIC INDICATORS

INDICATORS	2016	2017	2018	2019	2020	2021*
GDP (Annual % Variation)	-	1.6%	0.5%	0.4%	-5.9%	4,0%
GDP (Millions US$)	57,287	64,223	64,431	61,176	53,575	58,918
Population (Millions of people)	3.48	3.49	3.51	3.52	3.53	3,54
GDP per Capita (US$)	16,461	18,385	18,377	17,387	15,173	16,629
Unemployment Rate - Annual Average (% EAP)	7.8%	7.9%	8.3%	8.9%	10.4%	8,0%
Exchange Rate (Pesos per US$, Average Annual)	30.1	28.7	30.8	35.3	42.1	42,7
Exchange Rate (Annual Average Variation)	10.1%	-4.8%	7.3%	14.7%	19.2%	1,5%
Consumer Prices (Annual Cumulative % Change)	8.1%	6.6%	8.0%	8.8%	9.4%	7,3%
Exports of goods and services (Millions of US$)**	15,460	16,798	17,038	16,992	13,552	16.542
Imports of goods and services (Millions of US$)**	12,441	13,338	13,816	13,311	11,285	13.980
Trade Surplus / Deficit (US$ Millions)**	3,019	3,460	3,222	3,681	2,267	2.562
Trade Surplus / Trade Deficit (% of GDP)	5.3%	5.4%	5.0%	6.0%	4.2%	4,3%
Overall Fiscal Result (% of GDP)	-3.4%	-3.2%	-3.9%	-4.4%	-6.0%	-
Gross Capital Formation (% of GDP)	17.5%	15.8%	15.0%	14.6%	17.0%	-
Gross Public Sector Debt (% of GDP)	58.5%	60.5%	59.6%	60.8%	-	-
Foreign Direct Investment (US$ Millions) ****	-1,825	-601	163	1,837	2,630	-
Foreign Direct Investment (% of GDP)	-3.2%	-0.9%	0.3%	3.0%	4.9%	-

Sources: BCU, INE, MEF and estimated data (*). Fiscal result data include the effect of Law N°19590 (fifty percent). In 2017 the BCU adopted the methodology of the 6th balance of payments manual. Data based on this new methodology include purchase and sale of goods and re-exports and are available since 2012. Data are net flows so they may take negative values (**).

Uruguay *XXI*

INVESTMENT, EXPORT AND COUNTRY BRAND PROMOTION AGENCY

www.uruguayxxi.gub.uy

info@uruguayxxi.gub.uy

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