Investment opportunities

RENEWABLE ENERGIES

September 2017
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1. Why invest in the Renewable Energy Sector in Uruguay?

- Uruguay passes the longest period of economic growth since there are records. After 14 continuous years of growth, it is the most equitable country with the highest per capita income in Latin America. It is expected that in 2017 and 2018 the country will continue to grow and do so above the Latin American average.

- Uruguay has a sound trust on the part of national and foreign investors. During the last decade was the second country receiver of Foreign Direct Investment (FDI) and in relation with the GDP (5.3%) and the second country in utility reinvested on total utility (61%) of Latin America.

- Uruguay offers a complete legal framework that guarantees clear rules of the game and the broadest guarantees, promoting a favorable business climate with great social stability, besides granting attractive incentives to investors through a set of promotional regimes.

- The Law of Promotion and Protection of Investments No. 16.906 establishes that foreign investment receives the same treatment as national investment, there are no restrictions on the repatriation of capital, nor on the transfer of profits, dividends and interest.

- Within the framework of the Investment Law, the energy sector has obtained important tax exemptions that contributed to its development. The attractive promotion regime has allowed industries that invest in renewable energy generation to finance a large part of their investments through these exemptions.

- Based on the guidelines established by the Executive Power in 2008 and approved by a Multiparty Commission in 2010, the energy policy in Uruguay constitutes a State Policy.

- Uruguay's energy policy has made a strong commitment to renewable energies, with important goals of incorporation in the short term and attractive tax advantages. These goals were effectively achieved.

- Uruguay has a privileged location that provides favorable natural conditions for the generation of solar, wind and hydraulic energy (small hydraulic power plants) that complement the capacity of large hydraulic power plants already installed. There are also interesting opportunities for generation from biomass associated with agro industrial production.

- Both the government and private actors have made important investments in the sector, which since 2010 total more than US $ 7,000 million. Investment in energy infrastructure continues to be one of the government's priorities. In the 2015-2019 infrastructure plan, an amount of US $ 4,230 is expected to be invested in the sector.
The Uruguayan model regarding public-private association for the promotion of investments in this sector has proven to be extremely successful and is nowadays reproduced in several countries. The public state energy company, UTE, has executed several projects under different forms of association with private investors.

Various types of investment and financing are presented: ventures and public financing, traditional tenders, leasing contracts, projects financed by multilateral organizations (IDB, CAF, World Bank), bi-national ventures and public enterprises with capital market financing and pension funds.

The investments made by Uruguay are very relevant compared to other countries. The 2016 report of the REN 21 places Uruguay in the 3rd place in the world in relation to the level of investments in renewable energies as a percentage of GDP. In particular, the incorporation of wind power into the electricity grid stands out, which covered 23% of electricity consumption in 2016. As a whole, renewable energy accounted for 97% of this consumption.

Uruguay is ranked 10th in the Performance Index of the World Energy Architecture 2017 prepared by the World Economic Forum (WEF), led by countries such as Switzerland, Norway, Sweden, Denmark and France.

In the agreement reached in December 2015 at the XXI International Conference on Climate Change (COP21) in Paris, where a Uruguayan delegation participated, a set of directives was established in line with what Uruguay has been working on. At COP22 held in Morocco at the end of 2016, the country reaffirmed its commitment in that direction. In July 2017, the government presented the National Climate Change Policy, which aims to deepen the diversification of the energy matrix into sources of low intensity of greenhouse gas emissions.
2. Characterization of the energy industry in Uruguay

The availability of safe and reliable energy is a fundamental component for the development of the country. In Uruguay, the lack of oil or gas reserves, the limitation to expand existing hydroelectric capacities, and Law 16.832, which rules out nuclear energy as an energy source, offer **important opportunities for the incorporation of new energy sources, especially non-traditional renewable energy sources**.

In turn, the current regional energy situation - with the big neighbors (Argentina and Brazil) with energy deficit - represents an opportunity to take advantage of the changes that are already in process and become a net energy supplier, especially in the electric sector. Infrastructure deficits in the generation phase of neighboring countries will offer the possibility of expanding renewable generation capacity in Uruguay beyond their internal needs. In fact, the new electric interconnection line with Brazil inaugurated in 2016 has allowed us to export energy back to the neighboring country.

**Energy supply matrix**

Total energy supplied by Uruguay reached an all-time record of 5.432 ktoe in 2016, and a growth of 4% compared to figures reported in 2015. The country’s energy supply matrix shows that 62% of energy is generated from renewable sources while the share of oil is 37% (in 2006 it was 62%).

Historically, the Uruguayan energy system has been very dependent on weather conditions. The years of scarce rainfall resulted in low generation of hydroelectric energy that had to be compensated with a greater use of oil and its derivatives or with the importation of electricity.

In the latest years, the changes registered in the energy matrix have decreased the dependency of external factors and increased the energy autonomy in the country. This has been mitigated.

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1. At present, there are several onshore and offshore oil exploration projects, but these are in the prospecting stage and there are still no proven hydrocarbon reserves. See [Hydrocarbons Report Uruguay XXI](http://exploracionyproduccion.ancap.com.uy/).

2. In fact, in December 2015 the Argentine government decreed the energy emergency.

3. Kilotone equivalents of oil

4. Since different energy sources have different calorific powers, ktep (thousands of equivalent tons of oil) is used as a common unit of measurement (1 ktep = 10 million kilocalories)
Renewable energies

A very significant first change is associated with the greater use of biomass, which in 2016 generated 44% of energy, when traditionally it represented around 20% (average 1990-2007). This increase responds, in large part, to the installation of the UPM (former Botnia) and Montes del Plata pulp mills that generate energy as a by-product of wood processing.

Another change that is transforming the energy matrix, and that in 2014 has already begun to be reflected in the data, is the introduction of wind power generated from large-scale wind farms. In the Annex I the total list of wind farms in operation and under construction is presented.

On the other hand, the importance of hydroelectric power has reached its maximum in 2014, year of high water availability, and has represented a record of use. Anyway, the country's large water resources are already being used almost to the maximum and the future increase of this type of generation can only occur through micro generation.

It should be noted that the advancement of technology worldwide allows increasingly take advantage of the complementarity between hydraulic, wind and solar sources. In addition, the improvement of the storage systems by batteries, hydrogen bars or the accumulation by waterfalls - among others - will allow to efficiently manage the daily or seasonal peaks of generation. The incorporation of these technologies will enhance the use of existing resources and facilitate additional changes in the energy matrix in the future.
Evolution of energy demand and consumption

The Uruguayan economy has consolidated 14 years of growth, which has been reflected in a notable increase in the demand for energy. The increase in household income and the generalization of the use of new comfort elements have produced an expansion in energy demand.

In the productive sphere, there has been an increase in the utilization and productive capacity of existing companies, which, together with new ventures, have also contributed to increasing energy demand.

In this way, total final energy consumption reached a record in 2015, at 4,399 ktoe. After remaining relatively stable between 1970 and 1990, consumption showed a growing trajectory in the 90s until the crisis in 2000-2003. Subsequently, great dynamism was observed in energy consumption, which increased at an average annual rate of 6% between 2005 and 2015.

Although in this period the energy consumption of all sectors of the economy grew above the historical average, the productive sector has shown the greatest growth. Within this sector, the energy consumption of the industry was the one that showed the greatest dynamism, experiencing an average growth of 13% per year.

In the coming years, energy demand will continue to rise. According to the latest prospective study conducted by the National Energy Directorate (DNE), demand will grow at an annual rate of between 2.5% and 3.1% during 2012-2035, depending on the grade to which the energy efficiency measures can be implemented.

For more information: National Energy Balance

Source: Uruguay XXI base don DNE.

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5 Estudio de Prospectiva Energética 2014, MIEM, DNE.
National Energy Efficiency Plan

To complement changes in the energy matrix, reduce emissions and ensure energy self-sufficiency for a prolonged period of time, the government is also executing policies on the demand axis already foreseen in the multiparty agreement. The National Energy Efficiency Plan 2015-2024 establishes the necessary action lines to promote the efficient reduction of energy demand at the national level, in order to reach an avoided energy goal of 1,690 ktoe in the period 2015-2024⁶.

For more information on the implemented actions see: http://www.eficienciaenergetica.gub.uy

⁶Plan Nacional de Eficiencia Energética 2015 - 2024, MIEM.
Renewable energies

**Electrical System of Uruguay**

With an electrical network of 83,277 km, the country has an electrification rate that covers 99.7% of households. The Uruguayan national electric system consists of two large high voltage transmission networks. A 1,078 km 500 kV system links the Salto Grande dam (Uruguay river) and the Terra, Baygorria and Constitución dams (Rio Negro) with the Montevideo metropolitan area, the largest consumption center. It presents a branch to the city of San Carlos, located in the southeast of the country, which continues to the border with Brazil.

Likewise, a 150 kV network of 3,923 km connects generation plants with almost all departmental capitals and main consumption centers (72 stations of 150 kV).

Three connections with Argentina and two with Brazil allow the country to exchange electricity with its neighbors. Uruguay imports electricity from Argentina or Brazil to cover its demand in times of deficit and exports when there are surpluses. Until 2013 Uruguay was an importer of electricity, since then it has become a net exporter. Between 2014 and 2016, an average of 1,122 GWh was exported per year, that is, 9.5% of the total electricity generated.

Finally, the Uruguayan electricity system stands out for its reliability with respect to the rest of the Latin American countries. According to the Global Competitiveness Index of the World Economic Forum, Uruguay ranks first in Latin America in relation to the quality of electricity supply in the country.

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7 Urban and rural electrification rate, 2015, DNE.
8 [UTE en CIFRAS 2016](#)
9 [The Global Competitiveness Report](#), World Economic Forum, 2016-2017. El indicador “calidad del suministro eléctrico” rankea a los países a partir de la siguiente pregunta: “In your country, how reliable is the electricity supply (lack of interruptions and lack of voltage fluctuations)? [1 = extremely unreliable; 7 = extremely reliable]”
3. Energy Policy

The **Energy Policy** 2005-2030, which has been transformed into a **State policy**, establishes the guidelines in the field of energy at the national level with a long-term perspective. Approved by the Executive Branch in 2008, it was ratified by a Multiparty Energy Commission in Parliament in 2010.

Within the framework of this policy, a strong commitment is made to the diversification of the energy matrix and the incorporation of indigenous sources, particularly renewable energies. This pursues multiple objectives: achieving energy sovereignty, reducing costs, activating the national energy industry, reducing dependence on oil and mitigating the polluting effects by reducing the emission of greenhouse gases.

In line with the objectives of the energy policy, a complete Normative Framework focused on the development of renewable energies has been developed.

In the general investment regime **Law 16,906** and its last regulatory decree (decree 02/012), renewable energies are included within the use of clean technologies that generate additional incentives.

On the other hand, **Decree 354/009** that grants specific tax incentives for the sector has also been used - albeit to a lesser extent - by companies to generate electricity from renewable sources. In addition, the generation of solar thermal energy, the use of biofuels and microgeneration from renewable sources with the aim of reducing the energy costs of businesses and households are stimulated with specific legislation (See Normative Framework detailed in ANNEX 2)
4. Source of renewable energy in Uruguay

Uruguay has diverse natural resources for the development of renewable energies. A high water flow, constant and predictable winds, uniform solar irradiation throughout the entire territory (although with seasonal variation) and a thriving agroindustrial sector favor opportunities for generation from hydro, wind, solar and biomass energy.

What are the renewable energies?

Renewable energy is that which comes from virtually inexhaustible sources, either because of the immense amount of energy they contain or because they are capable of being regenerated by natural means. Among the main sources of renewable energy are: solar energy, wind energy, hydraulic energy, tidal energy (which results from taking advantage of tidal energy), geothermal energy (obtained through the use of heat generated in the inside the Earth) and biomass. Renewable energies are defined in contrast to non-renewable energies, which are those found in nature in limited quantities.

Biomass

Biomass is described as "all organic matter susceptible to energy use". This concept includes products and by-products of woody and herbaceous origin, also including certain industrial and municipal waste.

In the last years Uruguay suffered a significant modification in its agricultural sector, with a strong expansion in the production of products such as soy, rice and wheat. Additionally, the country has shown an important development of forestry activities. In this context, we have ventured into experiences of energy generation from rice husk, sugar cane, cellulose, sweet sorghum and wood.

This transformation is already reflected in the national energy matrix. In 2015, more than two thirds of the energy generated from biomass was generated from agro-industry waste or biofuels. This contrasts with 10 years ago when firewood represented 90% of the biomass used.
Renewable energies

On the other hand, an important effort has been made from the public sector to analyze the potential of the country for the generation of this type of energy. An example of this is the PROBIO projects (completed in 2014) and BIOVALOR (in execution), which deepen the knowledge of the generation of energy from agro industrial waste.

**Forestry residues**

It is estimated that in the crop, the forest residue generated is between 10% and 30% of the tree standing. Then, in industrial processes such as sawing, the production of residue is around 50% of the processed wood. According to the National Census of Sawmills (2014), there is an installed capacity of sawing in the country of between 3 and 3.2 million m³ / year, much of it in establishments of more than 50,000 m³ / year. The existence of large sawmills is presented as a possible advantage for the use of sawdust for the production of ethanol. Installing a plant next to these establishments reduces transport costs and stock needs. However, the technology available for this type of production is still incipient.

Energy is also generated from industrial waste from cellulose production. At the UPM and Montes del Plata plants, which have an installed capacity of more than 160 MW each, a third plant of similar capacity could be added.

In this way, there are 2 types of business model for the generation of energy from these materials. The establishment of a power generation plant as the main business or cogeneration as a by-product, which allows reducing costs and eventually dumping the surplus to the electricity grid. This division applies to other types of generation. Section 5 presents the most important undertakings of each of these models.

**Agricultural-livestock residues**

Although there are currently several generation experiences from other agricultural residues, these resources are under-exploited. One of the first sources of this type used in the country has been the rice husk. There are two processing undertakings for this waste (Galofer S.A. and Fenirol S.A.). There are also experiences with the use of bagasse (byproduct of sugar cane) for the production of electricity (ALUR).

In terms of waste generated by livestock activities, there are also experiences of biogas production from anaerobic digestion in the dairy area (Estancias del Lago) and wool production (Trinidad Wool).

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Within the framework of the BIOVALOR project, the potential for energy production based on agricultural and livestock waste throughout the national territory is being analyzed. According to the estimates published in September 2016, the main activities that generate organic waste are those associated with cattle production. The fattening livestock, the activities associated with the dairy, the refrigerators and the tanneries generate 71% of the total of these residues.

**Chart Nº7 – Generation of residues by sector (2014 -% of the total)**

- **Dairy industry** 14%
- **Dairy farms** 7%
- **Fattening** 36%
- **Breeding farms** 11%
- **Others** 12%
- **Slaughterhouses** 9%
- **Poultry** 10%
- **Sugar and alcohol** 2.2%
- **Ind. oleaginous** 4.7%
- **Tanneries** 2.3%
- **Breweries & malts** 0.9%
- **Viticulture** 0.7%
- **Chacinerías** 0.1%
- **Wool laundries** 0.1%
- **Others** 12%

Source: Project BIOVALOR (MIEM).

In 2010, with the support of the United Nations Industrial Development Organization (UNIDO), the results of a consultancy that analyzed the potential for generating energy from biomass from agricultural or industrial waste or byproducts were disseminated. In addition, between 2011 and 2014 the Project for the Production of Electricity from Biomass in Uruguay (PROBIO) was executed, a joint initiative of the National Government with the United Nations Development Program (UNDP). PROBIO aimed at the development of instruments for access to information, incentives for the development of local capacities, design and proposal of policy instruments to promote the energy use of biomass byproducts from forestry and other chains.

At the same time, since the end of 2013 Uruguay participates in a cooperation project called BIOVALOR, whose objective is the transformation of waste generated from agricultural, agro industrial activities and small population centers in energy and or by-products, in order to develop a sustainable model of low emissions (contributing to the reduction of Greenhouse Gases - GHG) through the development and transfer of appropriate technologies. In the first place, this project aims to analyze the reality of all the agro industrial chains of the country and the available technologies for the treatment of the corresponding waste.

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12 Evaluación de la disponibilidad de residuos o subproductos de biomasa a nivel nacional, DNE.

13 See [www.probio.dne.gub.uy](http://www.probio.dne.gub.uy) e Informe de Evaluación Final.

14 “Hacia una economía verde en Uruguay: estimulando prácticas de producción sostenibles y tecnologías con bajas emisiones en los sectores priorizados”, Global Environment Facility
Renewable energies

From this program, **Uruguay seeks to become an example of a green economy** by converting an environmental liability into an energy asset.

Detailed information was also generated on the volume of waste generated at the departmental level. Montevideo and its bordering departments are those that concentrate most agricultural waste, followed by the coastal departments of the Uruguay River.

This mapping of the amount of waste generated is available with several levels of detail. Discriminated data are presented by type of activity and by type of technology in which this waste could potentially be treated to be transformed into energy.

**Chart Nº8 – Total waste generated in 2014 at departmental level**

Source: Project BIOVALOR (MIEM).

The BIOVALOR project studied the different technologies available to valorize waste. Technical data sheets that analyze the potential for the application in Uruguay of anaerobic digestion, the production of alternative fuels and the composting of waste were prepared. Based on pilot plans in some prioritized sectors, more in-depth information will be generated on the possibilities of generating energy from these technologies.
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In 2016, 11 pilot proposals were selected from agricultural ventures that will carry out different experiences of organic waste valorization. Proposals were sought involving small-scale producers and a location close to the Santa Lucía basin. The project will co-finance the implementation of these projects with an investment of 1 million dollars while the producers will contribute 1.8 million.

It is expected in 2018 to have implemented the 11 projects whose main objectives are to generate the first lessons learned from the different experiences and develop a public policy that promotes the recovery of waste.

To deepen on the information generated by the BIOVALOR project see: [http://www.biovalor.gub.uy/](http://www.biovalor.gub.uy/)

Liquid biofuels

Uruguay - as an important agricultural producer - has conditions for the production of liquid fuels from biomass. The production of Bioethanol and Biodiesel has grown steadily since 2010. Its share of the gross energy supply went from 0.5% in 2010 to 2.2% in 2015.\(^\text{15}\)

The company ALUR S.A. (94% owned by ANCAP) is the main producer of agrofuels in the country. It has a production capacity of 100 million liters per year of Bioethanol whose main destination is the supply to ANCAP where it is mixed with gasolines at a percentage of 5%. In addition, it has an annual production capacity of 83 million liters of biodiesel that are also supplied to ANCAP, to make a 5% blend with diesel. The company has managed to place its products in international markets: Bioethanol has been exported to Chile and Biodiesel has managed to enter the Dutch market (the exported Biodiesel was generated from frying oil).

For the production of Bioethanol, ALUR S.A uses BT sorghum and sugarcane as raw materials. For its part, the raw materials used for the production of biodiesel include soybeans and canola, beef tallow and used frying oil.

Urban Residues

The use of urban solid waste (RSU) for the production of energy is a mechanism increasingly used worldwide as a way to mitigate the pollution generated by large urban centers.

Currently, Uruguay does not have plants of medium or large size for the transformation of urban waste into energy, beyond pilot plans carried out by some municipalities. For example, in Maldonado there is an electricity production plant from a sanitary landfill, Las Rosas. With an installed capacity of 1.2 MW, it generates electricity from the capture and burning of biogas. In Montevideo, a methane gas capture plant, under an agreement with the World Bank, generates Certificates of Emissions Reductions. In this last project, the gas generated could be used to generate electricity.

The treatment and final disposal of urban waste is the responsibility of each of the 19 municipalities in the country. According to the different available studies, it is estimated that the RSUs arranged in

\(^{15}\) Source: Energy Balance 2015, DNA, MIEM.
the main Final Disposal Sites total 1,100,000 tons / year of which 780,000 correspond to Montevideo\textsuperscript{16}.

In November 2015, the Chamber of Industries of Uruguay (CIU) inaugurated a final disposal site for industrial solid waste that receives part of the industrial waste from the capital and surroundings, coming from both public and private companies. The site receives waste from the primary industry (agro industry), secondary (manufacturing) and services.

The national and departmental authorities consider the recovery of waste through the production of energy as a necessary action and are interested in developing ventures of this type, covering several urban centers and understand that there are opportunities for the entry of private actors. The call to the construction of a treatment plant for the Intendencia de Canelones stands out (see Section 6).

**Solar**

Uruguay is located in a geographic latitude range that goes from 30\textdegree\ 04' to 34\textdegree\ 53'. The daily global irradiation on an annual average horizontal plane over the Uruguayan territory is 4.6 kWh / m\textsuperscript{2}. Although the seasonal variation is large, the geographical variation is reduced, due to the relative geographical uniformity of the Uruguayan territory.

At present, the Solar Energy Laboratory (LES) of the University of the Republic (UDELAR) has very detailed information about the characterization of the solar resource at a geographical and temporal level. Using satellite and plant-level information, a model was developed that allows forecasting of the available solar resource in each point of the territory.

In terms of thermal solar installations, these have had an important development in Uruguay in recent years, going from having 2 m\textsuperscript{2} / 1000 inhabitants at the end of 2009 to 16 m\textsuperscript{2} / 1000 inhabitants at the end of 2015.

**Wind**

Of the various uses that can be given to wind energy through the application of technology, the fastest growing in the world today is large-scale wind generation. This consists of the installation of wind farms connected to the electric power transmission network,

\textsuperscript{16} La gestión de residuos en Uruguay: Situación actual y estrategias a nivel nacional, MIEM, 2016.
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which are composed of variable quantities of large wind turbines (several hundred kilowatts or a few megawatts).

The best quality of the energy and the advances in terms of short-term resource prediction, currently give greater reliability to the wind source, allowing great penetration of wind power in the electrical systems of the countries. In this context, Uruguay has entered into a wind energy development program with heavy investments that have allowed it to take advantage of the great availability of the existing resource.

The topographic characteristics of the country, large plains with almost no obstacles, guarantee wind availability in a constant and predictable manner. A survey carried out by the MIEM and the Faculty of Engineering of the University of the Republic in 2009, has allowed the construction of a national wind map

In the Wind Map of Uruguay (2009) the average annual speed is available for different heights (15m, 30m, 50m and 90m) and areas of possible use with a potential of 1500 MW of installed power were identified. Wind speeds are between 5 m / s (10 m in height) and 7 m / s (60 m) in the coastal zone, and between 7 m / s and 9 m / s in hills. The values of the FC (Capacity Factor) are generally higher than 35%, which is why they are higher than those considered internationally usable. 17.

Wind Energy Program in Uruguay (PEEU): www.energiaeolica.gub.uy

Hydraulics

Hydraulic generation in Uruguay is one of the main sources of electricity. The hydro generator park consists of 3 cascading plants in the Río Negro of a total of 593 MW and a binational plant in the Uruguay River (Salto Grande) of 1890 MW of which 945 MW correspond to Uruguay and the rest to Argentina. Currently, the large-scale hydraulic exploitation in Uruguay is close to the maximum limit. In any case, there is additional capacity for the installation of small hydroelectric plants (PCH) that could eventually become an additional source of supply.

17 Source: Technology and Industrial Services, Engineering School.
5. Investments in the sector

The energy transformation experienced by Uruguay was possible thanks to an important public and private investment. According to Climatescope 2016, in the 2010-2015 period, US$ 4,700 million were invested in infrastructure to generate clean energy. If other investments not directly related to renewable energies are considered (transmission, distribution, conversion), *investments in the energy sector have been made that exceed US$ 7,000 million.*

Investment in energy infrastructure will continue to be a priority for the Uruguayan government. Within the 2015-2019 infrastructure plan that is being implemented, of the US $ 12,000 million committed, US $ 4,230 million correspond to the energy sector. By the end of 2017, 61% of these investments are expected to be executed.

**Financing Availability**

Despite being a small financial market, in Uruguay there are various mechanisms from which part of the financing of energy infrastructure projects can be obtained.

- **Bank Financing:**
  
The Bank of the Oriental Republic of Uruguay (BROU), owned by the State, is the main commercial bank in Uruguay and has participated in the financing of some wind farm projects in Uruguay. Uruguayan private banking is composed of banks of foreign origin that have already participated in the structuring of infrastructure projects.

- **Institutional Investors:**
  
The Administrators of Pension Savings Funds (AFAPs) have grown steadily in affiliates and savings amounts, tend to diversify their investment portfolio in long-term assets and since they can only invest in securities with high credit rating this type of investment is attractive for these institutions.

- **Infrastructure funds:**
  
  In 2017, a US$ 350 million fund began to operate through a trust managed by CAF, which contributes 10% of the financing for public projects with involvement of the private sectors.

- **Multilateral organizations:**
  
  They include financing in infrastructure projects within a broader framework of support for the country's structural reforms (IDB, World Bank, CAF). Through its investment segments in the private sector, they also channel foreign investment.

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18 Source: [Rendición de Cuentas y Balance de Ejecución Presupuestal, Informe económico – financiero Exposición de motivos](#), MEF, 2016
Renewable energies

- **Local Retail Market:**

  The small savers have been eager to channel their savings towards instruments offered by the stock market (Stock Exchange of Montevideo, Bolsa Electronica de Valores SA, Private investment funds). Private sector investments are channeled through negotiable obligations or trusts.

  Negotiable Obligations (NOs) are debt securities issued by private sector companies. It represents the simile of what are internationally called corporate bonds. They have a pre-established maturity and a fixed or resettable interest rate, but previously agreed upon. It does not imply participation in the ownership of the company. The issuing company undertakes to reimburse the capital and pay the corresponding interest within the established terms.\(^{19}\)

**Public Investments in Infrastructure**

**Biodiesel and ethanol plants from ALUR**

The company Alcoholes del Uruguay (ALUR) has 5 biofuel production plants. In 2013 the construction of a biodiesel plant in Capurro with a production capacity of 65 million liters per year was completed. At the end of 2014, a micro-distillery with a daily capacity of 1,000 liters of ethanol was inaugurated in Artigas, using as raw material sweet potatoes, sorghum and rice. While in February 2015, a plant in Paysandú began operating with a production capacity of 70 million liters of ethanol per year. In this way, the company owns plants in Bella Unión (anhydrous ethanol), Paysandú (anhydrous ethanol), Artigas (Hydrated ethanol micro-sink), Paso de la Arena (Biodiesel) and Capurro (Biodiesel).

**Combined cycle plant in Punta del Tigre**

At the end of 2012, UTE signed a contract with the South Korean company Hyundai Engineering & Construction (HDEC), awarding it the construction and maintenance (for 7 years) of a second combined cycle thermal terminal in Punta del Tigre. The construction of three turbines is planned (two steam and one gas). The gas turbine is expected to enter service in July 2017, while the steam turbines are scheduled to enter service in September 2017 and June 2018.

The total investment reaches US $ 741.2 million and the following entities participate of its financing: Inter-American Development Bank (IDB) (US$ 200 million), the Andean Development Corporation (CAF) (US$ 180 million), the German Bank of development with US$ 70 million and UTE with US$ 291.2 million.

The plant built will have a capacity of 531 MW and will contribute to diversify the country's energy matrix, mitigating energy vulnerability and dependence on oil in years of low rainfall. In turn, the electricity generated can be sold to neighboring countries thanks to the existing electrical interconnection.

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\(^{19}\) Financiamiento privado de la infraestructura de América Latina y el Caribe: Chile, Perú y Uruguay como casos de estudio, BID, 2017
Energy interconnection with Brazil in Melo (frequency converter and network laying)

In addition to these projects associated with energy development, a converter of energy frequencies was built in Melo (50/60 Hz) together with an important network layout, to be able to communicate Presidente Medici’s networks in Brazil with San Carlos (Uruguay). The total project involves an investment of US$ 300 million and was made with a contribution of US$ 83 million from the MERCOSUR Structural Convergence Fund (FOCEM).

With a capacity of 206 MVh per hour, the Melo converting plant has already exported to Brazil in the first half of 2017.

Companies in the Renewable Energy Sector

The remarkable transformation of the sector was possible thanks to the involvement of the private sector. Both national and foreign companies contributed to the development and implementation of new technologies. In this way these companies - many of them SMEs - were able to expand their capacities and are able to internationalize by providing services to the countries of the region. In this section, some of these actors are listed.

Companies related to the installation of wind farms

The sector of wind power generation is undoubtedly the one that has experienced the most notable development. This strong development has been possible thanks to the interaction of multiple actors from the public and private sectors. The companies involved include large and small firms, national and foreign, that fulfill multiple roles: park owners, financiers, project developers, consultants, manufacturers, importers and various service providers.

Many of these actors are part of the Uruguayan Association of Wind Energy (AUDEE), an organization that brings together companies in the sector and promotes the use of wind power as a renewable source of natural resources.

The following link presents an extensive list of actors prepared by the DNE.

See Guía de Actores de Energía Eólica en Uruguay
Renewable energies

Companies in the generation of energy from biomass

The pulp mills of UPM and Montes del Plata are the largest productive enterprises in Uruguay. They have a combined processing capacity of 8 million m³ of eucalyptus wood per year. The plants are energetically self-sufficient, take advantage of the waste dissolved in the cooking liquor, and in some cases also the remains of wood, to generate electricity. It has a generating capacity of 160 MW and 180 MW each, which exceeds its own consumption, selling the surplus to the grid.

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

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

The mechanical wood processing company Weyerhaeuser built an energy cogeneration plant that feeds on the by-products of the industrial treatment of wood. Its generation capacity is 12 MW, with consumption requirements in the plant 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 Timberland Investment Group (TIG) of BTG Pactual, which in June 2017 acquired all Weyerhaeuser's assets in Uruguay.

Renewable Energy Tacuarembó (Fenirol SA) generates electricity from forest waste and rice husk, being owned by four business groups of diverse origins: Conatel (electrical appliances), Tsakos (shipyards), Zenda (tannery) and Secco (refrigerated). The company was awarded one of the tenders for up to a total of 10 MW, which turns over to the electricity grid.

The company Ponlar S.A., located in Rivera, uses the byproducts of a co-adjacent sawmill to feed a steam boiler. Part of the steam is used to supply the thermal demand of the sawmill and part to generate electric power in a turbine with a power of 7.5 MW.

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

The company **ALUR**, 94% owned by ANCAP and 6% by Venezuela’s PDVSA, with four plants throughout the country (Bella Union, Paysandú, Capurro and Paso de la Arena) produced 57 million liters of biodiesel and some 70 million liters of bioethanol. The Biofuels Law (Law No. 18,195) establishes that they must be mixed in a 5% proportion in the substitution of diesel and gasoline. It also participates in the electric market by selling energy generated from bagasse, chips and eucalyptus sawdust in a cogeneration plant in Bella Unión with a capacity of 10MWh.

The company **Lumiganor S.A.**, located in Treinta y Tres, generates electricity by burning biomass of forest origin. The plant is built but is not yet in operation.

**Estancias del Lago S.R.L.** is an agro industrial company installed in Durazno that has a power generation plant from biogas to generate electricity for its production process.

The company **Lanas Trinidad S.A.**, located in Flores, is dedicated to wool production. It has a power generation plant based on biogas.

See [Listado de Generadores de Electricidad a partir de Biomasa](#)

**Companies in the solar power generation sector**

As part of the Solar Plan, which encourages the use of solar thermal energy in homes and businesses, suppliers and installers are required to be duly authorized by the DNE. You can check the list in this [link](#).

Many of the companies involved in the installation of parks and photovoltaic equipment are grouped in the Solar Chamber of Uruguay: [Socios de la Cámara Solar del Uruguay](#)

**Construcción of transmission lines**

In May 2017, the construction of a 500 kV electric transmission line between Melo and Tacuarembó was announced. Through an operational lease, the Italian company Terna SpA will design, build and supply the transmission line to UTE. UTE, will use and maintain the line through an operating lease agreement. Most of the project will be financed by the IDB and the China Co-financing Fund for Latin America and the Caribbean. For more information you can consult the following [link](#).
6. Opportunities associated with Renewable Energies

The country's natural conditions, the favorable regulatory framework for investment, an energy policy with clear objectives and the commitment of the authorities and the political system to continue advancing in the incorporation of renewable energies into the energy matrix ensure that in the short and long term in the future, important investment opportunities will continue to be presented.

Wind Farms

The policy of betting on wind energy has been very successful. Prior to 2008, there were no large-scale wind farms in the country. Currently there are a total of 42 parks in operation with an installed capacity of 1,383 MW. A generating capacity of 1,770 MW is expected when all projects under development are in operation.

This great investment was possible thanks to a varied menu of business models.

The incorporation of private parks was carried out through competitive bids that were presented in successive calls. In these, UTE awarded the winners electric energy purchase contracts (PPAs) that varied according to each call (Decrees 77/006, 403/009, 159/011 and 424/011).

For the incorporation of its own parks, UTE has resorted to different modalities: association with the Brazilian electricity company (Electrobras), trusts with the participation of institutional and private investors, operational leasings.

Both national and foreign companies have participated in these projects. As an example, the Italian company ENEL through Enel Green Power (EGP) has completed the installation and connection to the electricity grid of the "Melowind" wind farm, its first power plant in Uruguay. Other important foreign firms that have participated in wind farms are the German companies Enercon and Nordex SE; the Spanish companies Abengoa, Grupo Cobra and Gamesa and the American company Akuo Energy. In the Section 5, you can access a complete list of the actors in the sector.

In the case of wind farms financed through the domestic capital market, the participation in the structured financial trusts for the Pampa and Arias parks demonstrated the eagerness of retail investors and institutional investors to include these instruments in their investment portfolio. These different modalities could be used to continue expanding the wind farm as demand requires.

In order to promote the participation of the national industry in conjunction with the development of the electric energy sector, the minimum percentage requirement for a national component is included, and prizes are awarded for those projects that include a higher figure.

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20 http://medios.presidencia.gub.uy/tav_portal/2015/noticias/NO_S274/arias.pdf
Renewable energies

Solar Farms

The use of solar energy transformation technology, both thermal and photovoltaic, has experienced an important development in the country. To date there are 8 photovoltaic plants that turn their power to the electricity grid and there are several under construction, it is expected that the installed power reached 228.7 MW (see Annex I). In addition, the micro generation connected to the network went from 0.04 MW in 2011 to 5.39 MW in 2015.

Biomass Plants

In parallel, progress was made in the incorporation of unconventional biomass to the electrical matrix. In the call for Decrees 77/006 and 397/007, 60 MW from this input were also incorporated. An exclusive call for biomass (Dto 367/010) incorporated 0.6 MW of an anaerobic digestion plant (Lanas Trinidad) and the installation of a generation plant from forest waste with a capacity of 40MW (Bioenergy S.A.) is pending.

Small Hydroelectric Plants (PCH)

Between 2012 and 2014 the DNE of the MIEM carried out, with the support of the IDB, a series of studies to evaluate the energy potential of this type of facility in Uruguay, identifying the best places for its location and also considering those already existing dams that could be used with a multipurpose purpose22.

On one hand, 70 sites were identified as the most feasible for small-scale generation, with which the country would have an additional installed capacity of 231.5 MW. In addition, pre-feasibility studies were carried out for projects to install PCH in multipurpose dams with priority use of irrigation and subsidiary of hydroelectric generation. It includes 20 sites with existing dams and 17 for new dams. The profitability of the projects is not always guaranteed and depends, among other factors, on the irrigation modality.

Waste thermovaluation plant

The valuation of urban waste through its transformation into energy is one of the explicit objectives of energy policy. The treatment and final disposal of urban waste is the responsibility of each of the 19 local governments in the country.

According to a study carried out by the National Environment Directorate (DINAMA), with more than 1 million tons of solid waste generated per year, the Montevideo Metropolitan Area would be the most attractive for the installation of a large-scale power plant from the thermal treatment of waste 23.

22 See different documents in this link: http://www.miem.gub.uy/web/energia/-pequenas-plantas-hidroelectricas-pch-

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There is also the possibility of a project that covers urban waste throughout the country or regional associations that allow the viability of energy generation from the waste of several departments.

On the other hand, based on the technology available globally, today it is possible to manage profitably smaller volumes (eg 100-150 tons / day), with which the possibility of being able to specify several plants in the interior of the country becomes more feasible.

In 2017 the local government of Canelones launched a call for International Public Tender for the construction of a Plant for the reception, recovery and final disposal of Solid Waste, the plant will have among its objectives the generation of energy from waste24.

Opportunities related to the change of the energy matrix

There is another set of opportunities that, although not directly related to the generation of renewable energy, are a consequence of the irruption of these resources in the energy matrix. In this sub-section some of these opportunities are presented, especially related to changes in the electrical system.

National Electric System

The expansion of the electric generation capacity associated with renewable energies poses a series of challenges that must be faced in the short and medium term.

On the one hand, the generation was significantly decentralized. The wind farms must be installed where the winds are, the production of biomass near the industries and the photovoltaic panels in the sites of greater solar radiation. This requires an extended network with more high voltage lines and transmission stations.

On the other hand, by increasing the export of electricity it is necessary to ensure interconnection with neighboring countries. The new connection with Brazil in operation since 2016 was part of this necessary investment.

In its five-year budget, UTE plans to invest more than US $ 1 billion in the transmission and distribution network. These investments, such as those implemented in wind resources, may take different forms: own investments, traditional tenders and private investments under different participation schemes

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24 https://www.comprasestatales.gub.uy/consultas/detalle/mostrar-lamado/1/id/250135
Energy efficiency

As a complement to the changes in the energy matrix, the authorities are implementing the National Energy Efficiency Plan. This plan foresees to promote measures that include an economically convenient reduction in the amount of energy necessary to produce a product or service and, at the same time, ensure equal or higher levels of quality. Likewise, it is understood within this concept the substitution in the final use of traditional energy sources, by non-conventional renewable energy sources.

To achieve this objective, it is available, among other actions, to finance and / or guarantee investment projects and technical assistance in Energy Efficiency (EE) in the public and private sectors. For this, different economic and financial promotion instruments are available.

See: Plan Nacional de Eficiencia Energética

Intelligent Network

As different sources of energy are incorporated, the management of the electrical system becomes increasingly complex, both in the generation and distribution stages. On the one hand, it is necessary to complement the different energy resources in order to maximize the generation capacity and at the lowest possible cost. On the other hand, as the peaks of consumption - throughout the year and
Renewable energies

throughout the day - do not usually coincide with the most abundant and cheap generation moments, it is also necessary to optimize consumption.

Therefore, the authorities of the DNE and UTE intend to have an intelligent electricity network in the medium term, which will allow them to efficiently manage the demand. The company plans to invest US $ 192 million in the next 5 years to achieve this goal.

In 2016, UTE approved the awarding of 100,000 smart meters that will allow remote digital reading of consumption that will facilitate the implementation of multi-hour rates. Currently 87,000 customers integrate this type of rates. It is expected that in a maximum of 10 years, all households in Uruguay will have smart electricity consumption meters.

Energy storage

In order to continue expanding the generation capacity based on resources such as wind or solar energy (which are not non-dispatchable energy sources), in the long term it will be necessary to introduce more complex forms of variability management. One possible strategy is to achieve greater exchange dynamics with neighboring systems (Argentina and Brazil). The other is based on implementing energy storage mechanisms. The technologies available today are not very efficient (batteries) or too expensive (dams). However, it is estimated that in the future they would be a viable option for the country.

Transportation driven by electricity or biofuels

In Uruguay, the transport sector is the main consumer of oil derivatives and the second energy consumer behind the industry.

In this sense, the government has promoted both the generation of alternative sources to fossil fuels (biofuels) and electric mobility with the aim of reducing emissions of polluting gases, reducing noise pollution and achieving energy sovereignty in the transport sector.

Regarding electric mobility, among the incentive measures for electric vehicles that have been promoted since 2010, the following stand out: the reduction of the Internal Specific Tax (IMESI) applicable to hybrid and electric vehicles, the incorporation of electric utility vehicles to the cleaner production indicator of the Law of Promotion of Investments and the modification of the Global Tariff Rate for cars with exclusively electric propulsion engine that was set at 0%.

It is worth mentioning that the country is able to meet the demand for energy that may arise from the development of electric transport. In particular, the wind energy produced at night is sufficient to meet the expected increase in energy demand.

For its part, within the framework of the GEF project "Towards a sustainable and efficient urban mobility system in Uruguay" the installation of the "Electric Route" will be carried out, thus linking the cities of Colonia del Sacramento and Chuy through recharging points arranged every 60km. On March 28, 2017, the first milestone of the route that is located in the ANCAP station of Roosevelt Avenue and United Nations, in Punta del Este, was inaugurated.
As a result of the measures promoted, 60 utilitarian vans, 1 bus and 11 electric taxis are operating in 2017 and the addition of 13 more taxis is expected for the same year. On the other hand, within the framework of the GEF project, 5 buses and at least 6 utilitarian vans will be incorporated.

More information: [http://www.eficienciaenergetica.gub.uy/transporte](http://www.eficienciaenergetica.gub.uy/transporte)

### Benefits for electro-intensive companies

As a way to take advantage of the energy matrix for the consolidation of industrial development, UTE favors the tariff for electro-intensive companies. The last call for obtaining the benefit was made through [Decree 118/017](http://www.eficienciaenergetica.gub.uy/transporte) that established a period of application between May and June 2017. To access the benefits offered, the firms had to have an annual expenditure on acquisition of electric power to UTE greater than or equal to 2.5% of the annual Gross Production Value (VBP) and have at least one year of operation. The benefit provided to companies is associated with the maintenance or increase of physical production and consists of a monthly discount for the energy charge without VAT.

In the first edition (2015-2016), the measure resulted in greater industrial production reflected in a gross production value US$ 11 million higher from the 24 companies that applied, which also resulted in jobs, billing, taxes and spills about the national economy. In the 2017 edition, there were 92 electro-intensive industries that applied.

### Rate discounts for the productive sector

Generation costs have already been reduced due to the change in the country’s energy matrix and measures are being taken to move this reduction to the productive sector.

In May 2017, UTE announced a program of commercial benefits for dairy producers and companies or productive units of the dairy chain. The benefit consists of a monthly discount on the energy charge without VAT and is implemented in four levels depending on the characteristics of the beneficiaries. The discounts on rates will apply between June and December 2017.

Another of the implemented measures was carried out through the implementation of the "Opportunity Offer" pilot plan that involved the introduction of multi-hour rates for companies. The mechanism works through the establishment by UTE of tariffs differentiated by hours with discounts of up to 40%, depending on the surplus of energy available to the state company. The special rate is applied for the consumption that is above the average consumption, according to the selected day’s section.

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25 [Presidencia, 22 de Mayo de 2017 y Caras y Caretas, 23 de Agosto de 2017](http://www.eficienciaenergetica.gub.uy/transporte)

26 [Decreto N° 138/017 y El Observador, 23 de Setiembre de 2017](http://www.eficienciaenergetica.gub.uy/transporte)

27 [Presidencia, 7 de Abril de 2017](http://www.eficienciaenergetica.gub.uy/transporte)
7. Positioning and challenges

Uruguay has gone through a successful path in energy matters. The keys to success lie in the definition of a long-term state policy (25 years) and an adequate institutional and regulatory framework, which was adapted as the learning curve progressed. This allowed the design and realization of public-private collaboration opportunities in which both sectors benefited.

This process of transforming the energy matrix positions Uruguay at the forefront of the use of renewable energy in the world. The participation of 62% of renewable energies in the primary matrix (2016) is well above the world average (19%).

For its part, in 2016, 97% of Uruguayan electricity generation originated from renewable sources. This contrasts with a world average of 24.5%\textsuperscript{28}. In particular, the contribution of wind energy highlights Uruguay and places it as a world leader along with Denmark, Ireland and Portugal.

The investments made by Uruguay are very relevant compared to other countries. The 2016 report of the REN 21 places Uruguay in the 3rd place in the world in relation to the level of investments in renewable energies as a percentage of GDP. In particular, the incorporation of wind energy into the electricity grid stands out, which covered 23% of electricity consumption in 2016.

The Uruguayan model of stimulus to the renewable energy sectors has become a benchmark at a global level. In particular, the achievement of incorporating a strong private participation in investment through innovative promotion schemes that do not depend on direct subsidies is highlighted.

As an example, the International Agency for Renewable Energy (IRENA) includes in its guide for the design of renewable energy auctions, among others, examples of the calls made by UTE\textsuperscript{29}.

On the other hand, Uruguay ranks fourth in Climatescope 2016, a ranking prepared by the IDB and Bloomberg dedicated to evaluating the investment and distribution of clean energy in the 58 most important developing nations in the world. Uruguay stands out as the developing economy with the most favorable framework for investment in clean energy\textsuperscript{30}.

Finally, Uruguay is ranked 10th in the Performance Index of the World Energy Architecture 2017 prepared by the World Economic Forum (WEF). This index compares the performance of 127 countries in three dimensions: economic growth and development, access and energy security and

\textsuperscript{28} World average data are for the year 2015. Source: Renewables 2017 Global Status Report, REN 21.

\textsuperscript{29} Renewable Energy Auctions A Guide to Design, 2015, IRENA and CEM

\textsuperscript{30} Parameter I: "Enabling Framework of the Climatescope", includes a total of 22 indicators that evaluate a country’s policy and the structure of the energy sector, the penetration levels of clean energy, the attractive price level for the deployment of clean energy, and the expectations of the future size of the clean energy market: The Clean Energy Country Competitiveness Index
environmental sustainability. The indicator is led by countries such as Switzerland, Norway, Sweden, Denmark and France. For Uruguay it is highlighted that its position is based on a balanced improvement in the three dimensions and that the diversification of generation sources has reduced the vulnerability of its energy system.\(^{31}\)

With an electrical matrix that did not allow it to satisfy its consumption peaks, Uruguay was traditionally a net importer of electricity. In recent years it has become a net exporter, selling its surpluses mainly to Argentina. With the incorporation of the new interconnection with Brazil, it is in better conditions to also sell to the northern country.

The diversification also allows reducing the dependence on hydroelectric energy, which due to exposure to climatic fluctuations, implies a high variability in generation costs.

The achievements made allow a diversification of the matrix, ensure self-sufficiency, reducing dependence on fossil fuels. This independence makes it possible to align the energy policy with the commitment, reaffirmed at the XXI International Conference on Climate Change (COP21) of December 2015 in Paris, to contribute to the mitigation of the emission of greenhouse gases. Uruguay participated in the conference with a delegation coordinated by the National System of Response to Climate Change.

At COP22, held in Morocco in November 2016, Uruguay has reaffirmed its commitment to promote mitigation actions and adaptation to climate change. The country was one of the signatories of the "Biofuturo Platform", a coalition of 20 countries that seeks to accelerate the development of low carbon technologies as alternatives to fossil energy consumption.\(^{32}\)

In July 2017, the government presented the National Climate Change Policy\(^ {33}\) that among its objectives is to deepen the diversification of the energy matrix into sources of low intensity of greenhouse gas emissions. To achieve this goal, some lines of action are outlined:

i. **Promote strategies to consolidate the participation of renewable energies** in the electric energy matrix, in particular by incorporating energy storage systems in the management of variable power sources.

ii. **Deepen the participation of renewable energies and other clean sources** in the energy matrix.

In fact, the increase in the share of renewable energies in the electricity matrix has already resulted in a significant decrease in carbon emissions as a percentage of GDP that went from 0.16% in 2000 to 0.09% in 2015.\(^{34}\) Given the public policies proposed, it is expected to continue with this decrease.

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\(^{31}\) Global Energy Architecture Performance Index, 2017, WEF  
\(^{33}\) Política Nacional de Cambio Climático  
\(^{34}\) Objetivos de Desarrollo Sostenible: Informe Nacional Voluntario Uruguay 2017, OPP
Renewable energies

Therefore, for the coming years, Uruguayan energy policy has important challenges:

• Continue with the incorporation of renewable sources in the electrical matrix (wind, biomass, solar and micro-hydro).

• Expand the electricity transmission network by adapting it to a generation that is less geographically concentrated.

• To optimize the complementation among the different sources and to incorporate the combined cycle as a cleaner and cheaper dispatchable energy source than conventional thermal.

• Promote coordination with neighboring countries by strengthening regional energy integration. In this way, better management of energy surpluses will be achieved.

• Consolidate an Intelligent Electric Network (Smart Grid), which allows efficient coordination of energy supply and demand.

• Incorporate technologies for energy storage, as technological advances permit.

• Procure Energy Efficiency with an active policy that encourages saving and the rational use of resources.

• Continue the reconversion of agricultural waste to produce energy, transforming an environmental liability into an energy asset.

• Achieve important generation of energy from the thermal valorisation of urban solid waste.

• Incorporate clean energy into the transport sector by applying the latest available technologies, especially in collective urban transport fleets driven by electric power. The installation of the "Electric Route" that will link the cities of Colonia del Sacramento and El Chuy through recharging points arranged every 60km will be an important milestone to enable the incorporation of electric vehicles in Uruguay.
Annex 1 – Infrastructure for the generation of renewable energy

Hydroelectrical Centrals

<table>
<thead>
<tr>
<th>Central</th>
<th>Total power (MW)</th>
<th>Departament</th>
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</thead>
<tbody>
<tr>
<td>Binational Dam of Salto Grande</td>
<td>945*</td>
<td>Salto</td>
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<tr>
<td>Rincón de Baygorría</td>
<td>108</td>
<td>Durazno</td>
</tr>
<tr>
<td>Constitución</td>
<td>333</td>
<td>Soriano</td>
</tr>
<tr>
<td>Dr. Gabriel Terra</td>
<td>160</td>
<td>Tacuarembó</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,546</strong></td>
<td></td>
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</table>

* Corresponding to Uruguay

Solar Photovoltaic

<table>
<thead>
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<th>Name</th>
<th>Investor</th>
<th>Installed Power (MW)</th>
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<tbody>
<tr>
<td>D 133/013</td>
<td>La Jacinta</td>
<td>FRV B.V.</td>
<td>50</td>
<td>Salto</td>
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<tr>
<td>D 133/013</td>
<td>Alto Cielo</td>
<td>Nicolás Castellano Gard</td>
<td>20</td>
<td>Artigas</td>
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<tr>
<td></td>
<td>Del Litoral</td>
<td>Jolipark S.A.</td>
<td>16</td>
<td>Salto</td>
</tr>
<tr>
<td>D 133/013</td>
<td>Yarnel S.A.</td>
<td>Yarnel S.A.</td>
<td>9.5</td>
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</tr>
<tr>
<td>D 133/013</td>
<td>Natelu S.A.</td>
<td>Natelu S.A.</td>
<td>9.5</td>
<td>Soriano</td>
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<tr>
<td>D133/013</td>
<td>Raditon S.A.</td>
<td>Tecnova Renovables - Sky Solar Group</td>
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<td>Soriano</td>
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<tr>
<td>R 13.-1318</td>
<td>Casalko</td>
<td>Casalko S.A.</td>
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<tr>
<td>UTE</td>
<td>Photovoltaic Farm (Asahi)</td>
<td>UTE-Japan Embassy</td>
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<td>Salto</td>
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### Renewable energies

#### Development Projects

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<th>Departament</th>
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<td>D133/013</td>
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<td>Artigas/ Río Negro</td>
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<td>Dicano S.A.</td>
<td>11.25</td>
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<td>Petilcoran S.A.</td>
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<td>Paysandú</td>
</tr>
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<td>R 13.-1320</td>
<td>Fenima S.A.</td>
<td>9.5</td>
<td>Paysandú</td>
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<td>D133/013</td>
<td>Vignano S.A.</td>
<td>1</td>
<td>Paysandú</td>
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<td>D133/013</td>
<td>Edelbon S.A.</td>
<td>1</td>
<td>Paysandú</td>
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<td></td>
<td>Lafemir S.A.</td>
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<td>Paysandú</td>
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<tr>
<td></td>
<td>Minas</td>
<td>0.28</td>
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<td><strong>TOTAL</strong></td>
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#### Biomass

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<tbody>
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<td>Sweden- Finland - Chile</td>
<td>Montes del Plata</td>
<td>180</td>
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<tr>
<td>UPM S.A.</td>
<td>Finland</td>
<td>UPM-Kymmenene Oyj</td>
<td>161</td>
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<td>Galofe S.A.</td>
<td>Uruguay/Brazil</td>
<td>Consortium (5 rice mills)</td>
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<td>Weyerhaeuser S.A.</td>
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<td>Fenirol</td>
<td>Uruguay / GreEECE</td>
<td>Consortium of investor groups</td>
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<td>ALUR S.A.</td>
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<td>ANCAP - PDVSA</td>
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<td>PONLAR S.A.</td>
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<td>Liderdat S.A.</td>
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<td>Grupo Azucarilto</td>
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<td>Las Rosas</td>
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<td>Consortium Aborgama - Ducelit - I.M.Maldonado - UTE – PNUD</td>
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#### Development Projects

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<tr>
<th>Bidder name</th>
<th>Departament</th>
<th>Authorized Power (MW)</th>
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<td>Bioenergy S.A.</td>
<td>Tacuarembó</td>
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#### Wind

<table>
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<th>Call</th>
<th>Company</th>
<th>Wind farm</th>
<th>Power (MW)</th>
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<td>77/006</td>
<td>Agroland</td>
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<td>Rocha</td>
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<td>77/007</td>
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<td>Nuevo Manantial I -II</td>
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<td>Caracoles I</td>
<td>10</td>
<td>Maldonado</td>
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<td>UTE</td>
<td>UTE</td>
<td>PdeV</td>
<td>0.15</td>
<td>Lavalleja</td>
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<td>77/006</td>
<td>Magdalena</td>
<td>Kentlux</td>
<td>17.2</td>
<td>San José</td>
<td>may-11</td>
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<td>Florida</td>
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<td>Autoprod.</td>
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<td>Santa fe</td>
<td>1.8</td>
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<td>Eólica I</td>
<td>Palmatir</td>
<td>Cuch. de Peralta</td>
<td>50</td>
<td>Tacuarembó</td>
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<td>Eol. I/2</td>
<td>R del sur</td>
<td>Maldonado</td>
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<td>Minas I</td>
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<td>Polesine</td>
<td>Florida I</td>
<td>50</td>
<td>Florida</td>
<td>jul-14</td>
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<tr>
<td>77/006</td>
<td>Luz de Mar</td>
<td>Pintado I</td>
<td>18</td>
<td>Florida</td>
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### Development projects

<table>
<thead>
<tr>
<th>Call</th>
<th>Wind Farms</th>
<th>Company</th>
<th>Offered Power (MW)</th>
<th>Departament</th>
<th>Estimated Start-Up</th>
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<tr>
<td>UTE - R 13.384</td>
<td>Colonia Arias</td>
<td>UTE</td>
<td>70</td>
<td>Florida, Flores</td>
<td>In test</td>
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<tr>
<td>424/011</td>
<td>Parque Eólico Cerro Grande</td>
<td>Ladaner</td>
<td>50</td>
<td>Cerro largo</td>
<td>1st. Semester 2018</td>
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<td>Autoproduct./Venta exc. a UTE.</td>
<td>Corfrisa</td>
<td>Ventus</td>
<td>2</td>
<td>Canelones</td>
<td>1st. Semester 2018</td>
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<td>424/011</td>
<td>Sierra de las ánimas</td>
<td>Rio Mirador (ex Darinel)</td>
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<td>Molino de rosas</td>
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<td>Central de Generación Eólica Libertador I S.A.</td>
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<td>77/006</td>
<td>Libertador II</td>
<td>Central de Generación Eólica Libertador I S.A.</td>
<td>7,5</td>
<td>Maldonado, Lavalleja</td>
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<td>424/011</td>
<td>Libertador IV</td>
<td>Central de Generación Eólica Artigas S.A.</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>337</strong></td>
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<td></td>
</tr>
</tbody>
</table>

Renewable energies


The success of the sector is partly possible due to the existence of an Energy Policy that sets the course, a solid Institutionality and an attractive Regulatory Framework for the investor.

The 2005-2030 Energy Policy of Uruguay has been transformed into a State policy that establishes the main guidelines in the energy field at a national level with a long-term perspective. It was approved by the Executive Power in 2008 and ratified by a Multiparty Energy Commission of Parliament in 2010.

It is based on four elements:

• The Strategic Guidelines, which define the main conceptual axes of energy policy,
• The goals to be achieved in the short (5 years), medium (10 to 15 years) and long (20 years and more) term,
• The Lines of Action needed to achieve these Goals,
• The Permanent Situation Analysis of the energy issue in the country, in the region and in the world.

The Energy Policy makes a strong commitment to the diversification of the energy matrix, to the incorporation of autochthonous sources in general and, in particular, of renewable energies. This commitment has several objectives among which are to achieve energy sovereignty, the reduction of costs, the activation of the national energy industry and the reduction of dependence on oil.

See more information in the following link: Política Energética 2005-2030.

Institutionality

Executing unit of the Ministry of Industry, Energy and Mining (MIEM) responsible for proposing and coordinating the national energy policy. Among its main obligations are to coordinate and guide the actions of the actors that operate in the energy sector and to participate in the development of regulatory and regulatory frameworks for energy activities.

::Web site:: www.dne.gub.uy

The National Administration of Power Plants and Transmissions (UTE) is a state-owned company dedicated to the generation, transmission, distribution and commercialization of electric power. Although there is a spot market, the vast majority of private energy generators sell the electricity they produce.

::website:: www.ute.com.uy

State company that performs various activities in the markets of production, distribution and commercialization of fuels, alcohol and portland. For the operation in these markets it participates directly and as a shareholder (in many cases a majority) or owner of several companies that operate in some of these lines of business. At the energy level, the activities related to natural gas and liquid fuels stand out. In terms of renewable energy, the company ALUR - producer of biofuels - has ANCAP as the majority shareholder.

::web site:: www.ancap.com.uy

The regulatory body of the sector is the Regulatory Unit of Energy and Water Services (URSEA), created as a decentralized body of the Executive Power, with control competence in the electricity, gas and hydrocarbons markets, in which public companies operate mentioned. Web site: www.ursea.gub.uy

::Web site:: www.ursea.gub.uy
Renewable energies

The Electricity Market Administration is a non-state public entity that manages the Electricity Wholesale Market.
::web site:: www.adme.com.uy

The Investment Law Enforcement Commission operates within the Ministry of Economy and Finance and has the purpose of promoting and protecting investments made by national and foreign investors in the national territory.
::web site:: http://comap.mef.gub.uy

The Uruguayan Association of Private Generators of Electric Power is the non-profit civil association that brings together the majority of private electric power generators located in the Uruguayan territory, which have current contracts with UTE or connection agreements with the National Interconnected System (WITHOUT). It is made up of 28 companies that have more than 1000 MW of generation power in total
::web site:: www.augpee.org.uy

The Uruguayan Association of Wind Energy is a civil association that is dedicated to promoting, grouping companies or people, supporting, themes and projects oriented to the use of Wind Power as a renewable source of natural resources. It currently has about 100 active partners among developers, suppliers, consultants and logistics operators
::web site:: www.audee.org

Association that brings together solar energy companies that operate in the country, importers, manufacturers, and planners of facilities”
::web site:: www.camarasolardeluruguay.com.uy

Other institutions and programs

<table>
<thead>
<tr>
<th>Institution/Program</th>
<th>Website</th>
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<td>Wind energy program in Uruguay</td>
<td><a href="http://www.energiaeolica.gub.uy">www.energiaeolica.gub.uy</a></td>
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<tr>
<td>Solar energy program in Uruguay</td>
<td><a href="http://www.energiasolar.gub.uy">www.energiasolar.gub.uy</a></td>
</tr>
<tr>
<td>Probio Project</td>
<td><a href="http://www.dne.probio.gub.uy">www.dne.probio.gub.uy</a></td>
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<tr>
<td>Biovalor Project</td>
<td><a href="http://www.biovalor.gub.uy">www.biovalor.gub.uy</a></td>
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<tr>
<td>Energy Efficiency Plan</td>
<td><a href="http://www.eficienciaenergetica.gub.uy">www.eficienciaenergetica.gub.uy</a></td>
</tr>
<tr>
<td>Ministry of Housing Territorial Planning and Environment</td>
<td><a href="http://www.mvotma.gub.uy">www.mvotma.gub.uy</a></td>
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<tr>
<td>Private Sector Support Unit (UNASEP)</td>
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<td>National System of Response to Climate Change</td>
<td><a href="http://www.cambioclimatico.gub.uy">www.cambioclimatico.gub.uy</a></td>
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<td>National Agency for Research and Innovation (ANII)</td>
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<td>Technological Laboratory of Uruguay (LATU)</td>
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<td>Universidad Tecnológica del Uruguay - Renewable Energy Engineering</td>
<td><a href="http://www.urtec.edu.uy">www.urtec.edu.uy</a></td>
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<td>Technological Pole of Pando - R &amp; D - Renewable Energies</td>
<td><a href="http://www.polotecnologico.fq.edu.uy">www.polotecnologico.fq.edu.uy</a></td>
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</tbody>
</table>
Renewable energies

Regulatory Framework of the Electric System

The Regulatory Unit for Energy and Water Services (URSEA) is the state institution that regulates, supervises and advises the generation, transmission and distribution of Electric Power.

Law 16.832 of the Electric Regulatory Framework that was approved in June of 1997 establishes the freedom of generation of electric power by any public or private entity. For its part, it establishes that transmission and distribution (as soon as they are totally or partially allocated to third parties on a regular or permanent basis) are the responsibility of the state entity UTE.

For a complete overview of the regulations governing the electricity sector see: http://www.ursea.gub.uy/Inicio/Energia_Electrica/Marco_Normativo/.

General scheme for investment promotion

**Law 16.906** of 1998 declares the promotion and protection of national and foreign investments of national interest. Investment projects, in any sector of activity, that are presented and promoted by the Executive Power, may exempt the Income Tax from Economic Activities (IRAE) between 20% and 100% of the amount invested, according to the definition of the draft. The national rate for the IRAE is 25%. Property tax is also exonerated from fixed assets and civil works and VAT is recovered from purchases of materials and services for the latter. Also, the importation of movable assets of fixed assets, declared non-competitive of the national industry, is exempted from taxes or fee.

Specific regimes for renewable energies

There is a regulatory framework aimed at the development of the renewable sector, the increase in private participation in electricity generation and the increase in investments in the sector.

**Decree 02/2012** of Law 16.906 grants tax incentives to investment projects declared to be promoted by the Executive Power. Among the projects that seek to promote the Law are those that verify the fulfillment of goals regarding the **Use of Clean Technologies**. Other promoted goals have to do with the Generation of Employment, Decentralization, Increase of Exports, the Increase of Research and Development and Innovation (I + D + i) and specific Sectoral Indicators.

For its part, **Decree 354 of 2009** grants specific tax incentives for the renewable energy sector based on article 11 of the Law on the Promotion and Protection of Investments.

Decree **23/2014** establishes that the investments made in wind generation projects destined to the national interconnected system are considered included in the concept of intangible assets foreseen by Decree 02/012 at the time the assets are transferred to UTE.

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Renewable energies

Law of Solar Thermal Energy

The Law for the Promotion of Solar Thermal Energy (Law 18.585 of 2009) declares research, development and training in the use of solar thermal energy of national interest. In this regard, investments in the manufacturing, implementation and effective use of solar energy are included as some of the activities available to access the exemptions provided by Law 16.906 mentioned above. Additionally, the Executive Power is authorized to exonerate and reimburse total or partial Value Added Tax (VAT), Internal Specific Tax (IMESI) and customs taxes to solar collectors manufactured domestically and imported that are not competitive with the national industry as well as domestic and imported goods and services not competitive with the national industry, necessary for its manufacture. Decree 451/011 regulates the benefits granted by the Law and authorizes the sale of on-site equipment exempt from local VAT.

Additionally, it seeks to promote the insertion of this technology in various sectors of activity in Uruguay, by establishing mandatory incorporation in all new construction for large consumer sectors such as hotels, health centers and sports clubs

In turn, the Solar Plan was launched, which finances and provides bonuses for the acquisition of solar collectors in the residential sector and will allow the user to have between 15 and 20 years of net electric savings. These two measures can be a strong incentive for those companies linked to the provision of inputs and equipment associated with solar generation.

Biofuels

Within the Law 18,195 of 2007 that regulates the production of biofuels and its regulatory decree (Decree 523/008) stipulates that its production and export is outside the state monopoly that applies to the rest of fuels.

In addition, a series of tax incentives for producers are foreseen. Article 25 of Decree 523/008 establishes:

The tax benefits provided by Law 18,195 will apply exclusively to companies duly registered in the registry provided for in the Law that is regulated and will include:

a) In relation to the exemption of Wealth Tax, assets of fixed assets included in Law 16.906 directly affected to the production of fuel alcohol and biodiesel. In the event that the aforementioned assets are partially affected by the aforementioned transfer, a technically acceptable coefficient must be applied to determine the exonerated part. The amount of exempt assets will be considered taxable assets for the purpose of deduction of liabilities.

b) In relation to the Income Tax of Economic Activities (IRAE), the exemption will reach 100% of the income generated directly and exclusively in the production of fuel alcohol and biodiesel, and will not be applicable to those generated in the production of other goods, although they arise as by-products of said industrial process.
Renewable energies

Promotion of microgeneration

Although the micro-generation arose in the first instance in places where the supply to the traditional electricity grid was not accessible, then micro-generation solutions began to be implemented as a complement to this source.

Decree 173/010 \(^{38}\) authorizes subscribers connected to the low voltage distribution network to install renewable wind, solar, biomass or mini-hydro generation, fulfilling some requirements in relation to installed power.

The Decree entrusted the MIEM with the approval of the general conditions to govern bi-directional exchanges between the micro generator and the distributor. Initially, the conditions established by the MIEM determined that UTE would buy all the energy delivered to the network at the same price as in the tariff schedule. The Ministerial Resolution of May 12, 2017 \(^{39}\) established a requirement for an adequate relationship between the generation to be installed and the consumption of the micro generator company with the objective of avoiding the installation of undertakings whose main objective is not self-consumption. The resolution applies to micro generation projects that are submitted after the date thereof.

Electric self-consumption

The generation of electrical energy for own consumption - plants isolated from the grid or that, being connected, do not inject energy - is regulated by Decrees 43/015 and 114/014. It is established that the power installed below 150 kW will not require authorization from the MIEM, although it will require prior registration, while those that exceed this threshold must manage a specific authorization that will consider environmental and safety rules. On the other hand, if hydraulic resources of public domain are used, water use authorization will also be required.

Energy Efficiency

The National Energy Efficiency Plan is regulated by Law 18,597, which was approved in 2009. This law establishes the implementation and deepening of various lines of work for the promotion of energy efficiency, as well as the appropriate financial mechanisms to promote the use of efficient energy in the country. \(^{40}\)

More information on sector regulations:

http://www.dne.gub.uy/marco-normativo/energias-renovables

\(^{38}\) https://www.impo.com.uy/bases/decetos/173-2010
\(^{39}\) Resolución 12 de Mayo de 2017, MIEM
\(^{40}\) http://www.eficienciaenergetica.gub.uy/marco-legal
Uruguay in synthesis (2017)  

Official name: Oriental Republic of Uruguay  
Geographical location: South America, bordered by Argentina and Brazil  
Capital City: Montevideo  
Area: 176,215 sq mts. 95% of its territory is productive land apt for farming exploitation  
Population (2016): 3.48 million  
Population growth (2016): 0.4% (annual)  
GDP per capita (2016): US$ 15,062  
Currency: Uruguayan Peso ($)  
Literacy index: 0.98  
Life expectancy at birth: 77 years  
Form of Government: Democratic republic with presidential system  
Political Division: 19 provinces or departments  
Time Zone: GMT - 03:00  
Official Language: Spanish  

Main economic indicators 2012-2017

<table>
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<th>Indicators</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017e</th>
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<td>GDP (Var % Annual)</td>
<td>3.5%</td>
<td>4.6%</td>
<td>3.2%</td>
<td>0.4%</td>
<td>1.5%</td>
<td>3.0%</td>
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<tr>
<td>GDP(Millions U$)</td>
<td>51.265</td>
<td>57.531</td>
<td>57.236</td>
<td>53.275</td>
<td>52.420</td>
<td>58.507</td>
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<tr>
<td>Population (Millions people)</td>
<td>3.43</td>
<td>3.44</td>
<td>3.45</td>
<td>3.47</td>
<td>3.48</td>
<td>3.49</td>
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<tr>
<td>GDP per Cápita (U$)</td>
<td>14.962</td>
<td>16.723</td>
<td>16.572</td>
<td>15.366</td>
<td>15.062</td>
<td>16.749</td>
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<tr>
<td>Unemployment Rate - Annual Average (% PEA)</td>
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<td>6.5%</td>
<td>6.6%</td>
<td>7.5%</td>
<td>7.8%</td>
<td>8.2%</td>
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<tr>
<td>Exchange rate (Pesos per US $, Annual average)</td>
<td>20.3</td>
<td>20.5</td>
<td>23.2</td>
<td>27.3</td>
<td>30.2</td>
<td>29.5</td>
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<td>Exchange rate (Annual Average Variation)</td>
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<td>0.8%</td>
<td>13.5%</td>
<td>17.6%</td>
<td>10.4%</td>
<td>-2.2%</td>
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<tr>
<td>Consumer Prices (Annual accumulative% Var)</td>
<td>7.5%</td>
<td>8.5%</td>
<td>8.3%</td>
<td>9.4%</td>
<td>8.1%</td>
<td>6.0%</td>
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<tr>
<td>Surplus / Trade deficit (Millions US$)</td>
<td>-1.172</td>
<td>-1.111</td>
<td>-776</td>
<td>254</td>
<td>1.118</td>
<td>1.312</td>
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<tr>
<td>Surplus / Trade deficit (% of GDP)</td>
<td>-2.3%</td>
<td>-1.9%</td>
<td>-1.4%</td>
<td>0.5%</td>
<td>2.1%</td>
<td>2.2%</td>
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<td>Global Fiscal Result (% of GDP)</td>
<td>-2.7%</td>
<td>-2.3%</td>
<td>-3.5%</td>
<td>-3.6%</td>
<td>-3.9%</td>
<td>-3.5%</td>
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<tr>
<td>Gross capital formation (% of GDP)</td>
<td>22.9%</td>
<td>22.5%</td>
<td>21.2%</td>
<td>19.7%</td>
<td>18.7%</td>
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<td>Gross Debt of the Public Sector (% of GDP)</td>
<td>60.7%</td>
<td>57.5%</td>
<td>58.6%</td>
<td>58.9%</td>
<td>63.6%</td>
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<tr>
<td>Foreign Direct Investment (Million US $)</td>
<td>2.536</td>
<td>3.032</td>
<td>2.188</td>
<td>1.280</td>
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<tr>
<td>Foreign Direct Investment (% of GDP)</td>
<td>4.9%</td>
<td>5.3%</td>
<td>3.8%</td>
<td>2.4%</td>
<td>1.7%</td>
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</tr>
</tbody>
</table>

Sources: The data referred to the GDP were taken from the IMF, the data of foreign trade, FDI, exchange rate, international reserves and external debt come from the BCU; Population growth rates, literacy, unemployment and inflation come from the National Institute of Statistics. Estimated data for 2017.