21st Century POWER PARTNERSHIP
Accelerating the transformation of power systems

URUGUAY'S ACTION PLAN AND EXPERIENCE FOR POWER SECTOR DECARBONIZATION

Ministry of Industry, Energy and Mining
September 2024

Uruguay

BACKGROUND

A collaborative report from the Clean Energy Ministerial (CEM), *Lessons Learned for Rapid Decarbonization of Power Sectors*, was delivered to energy ministers and presented at the 13th CEM (CEM13) in the United States in September 2022. In light of these lessons learned and discussed at CEM13, several jurisdictions signaled intent to develop Action Plans for power sector decarbonization. The first cohort of Action Plans was released at CEM14 in India in July 2023. The Uruguay Ministry of Industry, Energy and Mining is pleased to release this Action Plan as a contribution to the second cohort of Action Plans released at CEM15 in Brazil in October 2024.

The Action Plans, supported by the 21st Century Power Partnership, and other CEM workstreams via direct technical assistance and capacity building, are intended to focus on select implementation actions given each country's existing power sector goals and activities, and are an opportunity for countries to display leadership in power sector decarbonization. The Action Plans are organized in a framework for planning, building, and operating, as well as stakeholder engagement where appropriate based on country priorities. They complement, but are differentiated from, other international power sector initiatives such as the Breakthrough Agenda (whose broad purpose is to raise collective ambition) and the Global Power System Transformation Consortium (whose goals are to convene power system operators to accelerate research innovations and foster peer learning).

These Action Plans are voluntary, developed by each country individually, not comprehensive of all activities within the jurisdiction, and are living documents that are subject to change.

Uruguay

RELEVANT INSTITUTIONS

Directly linked institutions:

DNE – MIEM	Ministry of Industry, Energy and Mining	https://www.gub.uy/ministerio-industria-energia-mineria/
ADME	Electricity Market Administrator	www.adme.com.uy
URSEA	Regulator	https://www.gub.uy/unidad-reguladora-servicios-energia-agua/
UTE	Owned-state utility	www.ute.com.uy

Private associations:

AUDER	Renewable Energy Association	www.auder.com.uy
AUGPEE	Private Generators Association	www.augpee.com.uy

Indirectly linked institutions:

OPP	www.opp.gub.uy
MEF	https://www.gub.uy/ministerio-economia-finanzas/
MA	https://www.gub.uy/ministerio-ambiente/
Regionals Gov.	https://www.gub.uy/congreso-intendentes/
Academy	https://www.conicyt.gub.uy/

Uruguay

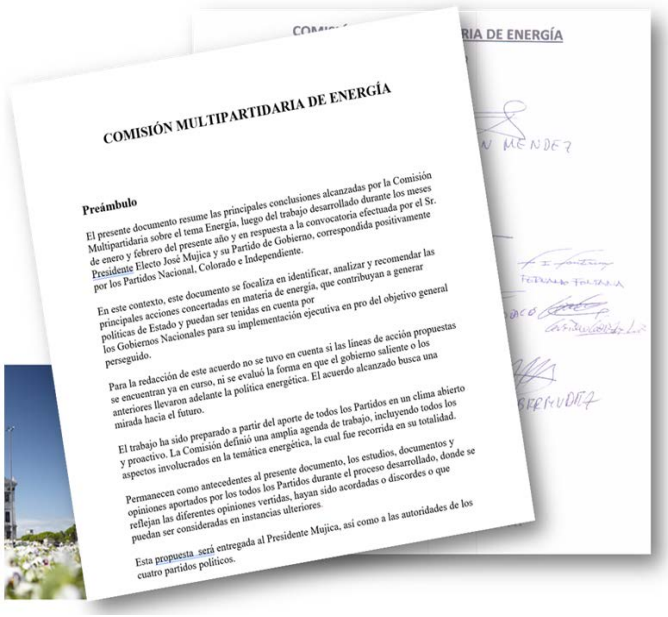
I. PLANNING

Action Plan for Rapid Decarbonization of the Power Sector

CLEAN ENERGY MINISTERIAL
Advancing Clean Energy Together

Uruguay

DECARBONIZATION HISTORY (I)


COMISIÓN MULTIPARTIDARIA DE ENERGÍA

Preámbulo

El presente documento resume las principales conclusiones alcanzadas por la Comisión Multipartidaria sobre el tema Energía, luego del trabajo desarrollado durante los meses de enero y febrero del presente año y en respuesta a la convocatoria efectuada por el Sr. Presidente Electo José Mujica y su Partido de Gobierno, correspondida positivamente por los Partidos Nacional, Colorado e Independiente.

En este contexto, este documento se focaliza en identificar, analizar y recomendar las principales acciones concertadas en materia de energía, que contribuyan a generar políticas de Estado y puedan ser tenidas en cuenta por los Gobiernos Nacionales para su implementación ejecutiva en pro del objetivo general perseguido.

Para la redacción de este acuerdo no se tuvo en cuenta si las líneas de acción propuestas se encuentran ya en curso, ni se evaluó la forma en que el gobierno saliente o los anteriores llevaron adelante la política energética. El acuerdo alcanzado busca una mirada hacia el futuro.

El trabajo ha sido preparado a partir del aporte de todos los Partidos en un clima abierto y proactivo. La Comisión definió una amplia agenda de trabajo, incluyendo todos los aspectos involucrados en la temática energética, la cual fue recorrida en su totalidad.

Permanecen como antecedentes al presente documento, los estudios, documentos y opiniones aportados por los todos los Partidos durante el proceso desarrollado, donde se reflejan las diferentes opiniones vertidas, hayan sido acordadas o discordes o que puedan ser consideradas en instancias ulteriores.

Esta propuesta será entregada al Presidente Mujica, así como a las autoridades de los cuatro partidos políticos.

In 1997, the Energy Market Law laid the foundations for establishing an electricity market. In 2002 the General Regulations for the National Electrical System regulatory framework was approved. In 2010, Uruguay, based on a political agreement involving all parties with parliamentary representation, promoted the decarbonization of the electricity sector and the increase of sovereignty through the aggressive incorporation of nonconventional renewable energies, complementing the historical participation of hydroelectric resources in the generation mix.

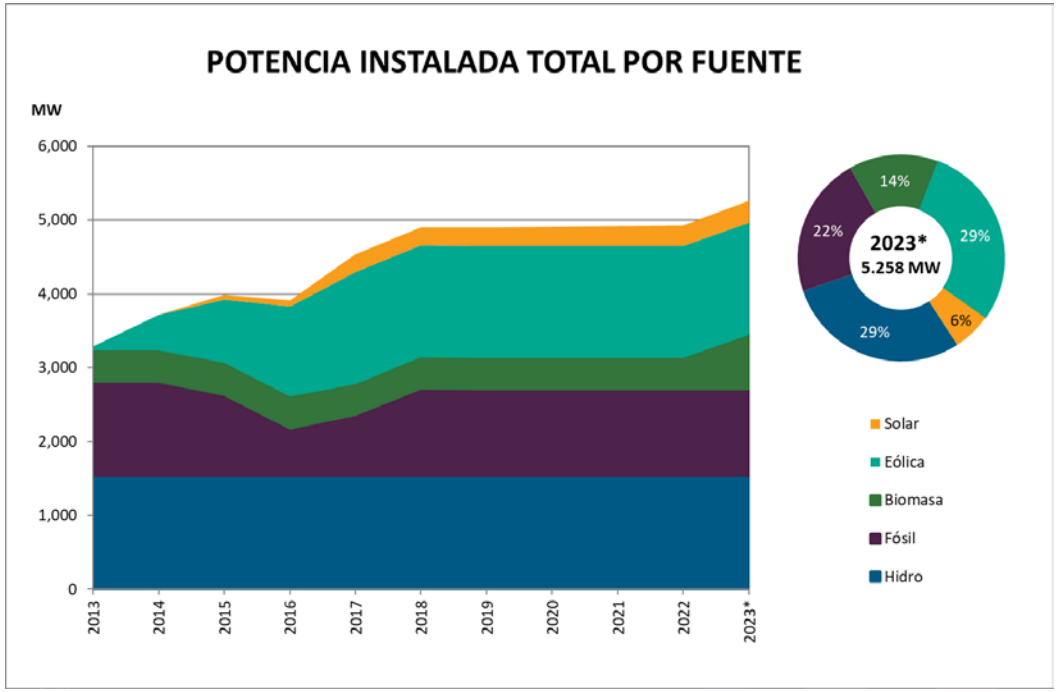
The mechanism for the incorporation of renewable energies was **based on the execution of auctions** assigning capacities per source to those that were identified as being competitive with the sources they were intended to displace.

As a result of this process, measures were developed to incorporate electricity generation from **biomass** (2006 and 2010), **wind** (2006, 2009, 2010, and 2011), and finally **solar** (2013).

Current situation: Review and redefinition of goals and lines of action is in process.

Uruguay

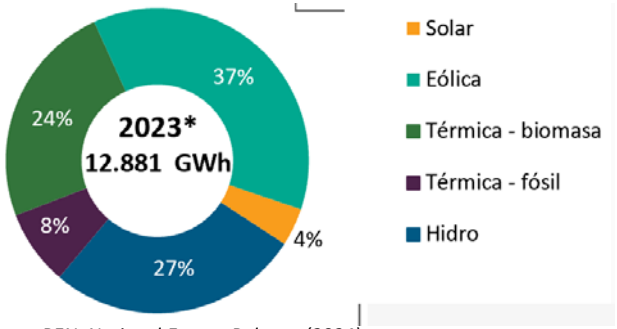
DECARBONIZATION HISTORY (II)



Source: BEN: National Energy Balance (2024)

The **positive impacts of the transformation** of the electricity sector are observable in every dimension:

- In just 10 years, Uruguay practically **doubled its generation capacity** by installing **renewable technologies**.
- As a result of the incorporation of these assets, it is possible to ensure a **participation of more than 90% of indigenous renewable sources in the electricity matrix** (97% in a year of average hydropower).



Source: BEN: National Energy Balance (2024)

Uruguay's electricity matrix reached 92% renewables even in the year with the lowest hydro contribution on record.

Uruguay

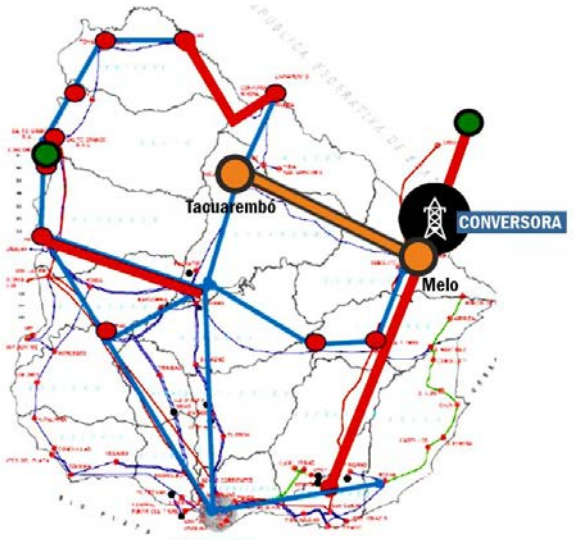
DECARBONIZATION HISTORY (III)

Source: National Energy Balance (BEN) (2024)

The robustness of the National Interconnected System (SIN) has been increased through distributed generation and the reinforcement of transmission lines ("ring closure").

The Uruguayan electricity system has gone from being a centralized and inflexible hydrothermal system to a geographically distributed system throughout the country, adding wind, solar, and biomass waste generation to the historical power plants.

In addition, the transmission system has been reinforced in order to make the SIN more robust, moving from a radial system to a system with redundancy (ring closure of 500-kV transmission lines).



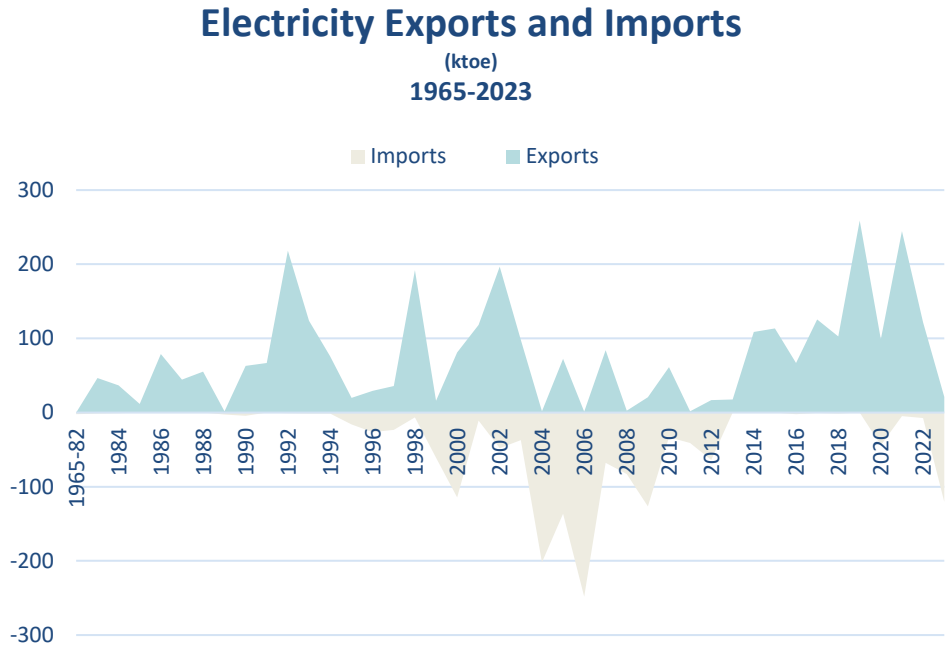
Source: National Administration of Power Plants and Electrical Transmissions (UTE)

Uruguay

DECARBONIZATION HISTORY (IV)

Traditionally, Uruguay had the role of regional energy sink for part of the region, resorting to the systematic import of electricity in order to meet its domestic demand.

As a result of the transformation of the electricity generation sector and the regional interconnection infrastructure with Brazil (complementing the historic interconnection with Argentina through the Salto Grande hydroelectric power plant), Uruguay has become a net exporter of electricity since 2013 in years of average rainfall.

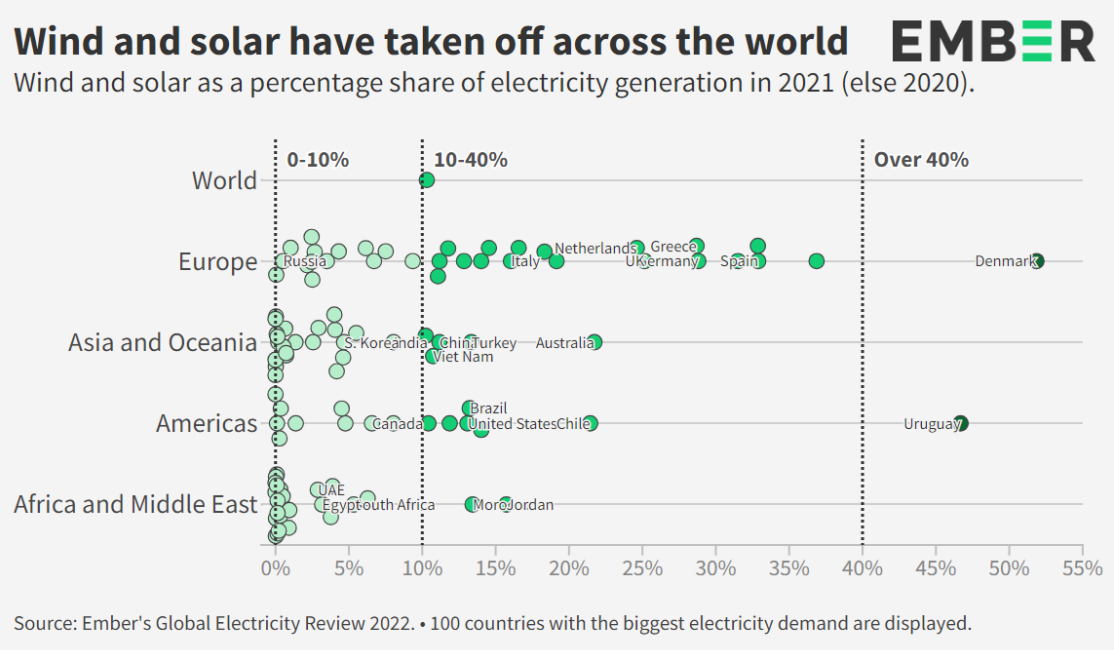


Source: BEN: National Energy Balance (2023)

Uruguay changed its role from a net electricity importer to net electricity exporter.

Uruguay

DECARBONIZATION HISTORY (V)



Source: BEN (2024) & Ember Global Electricity Review (2022)

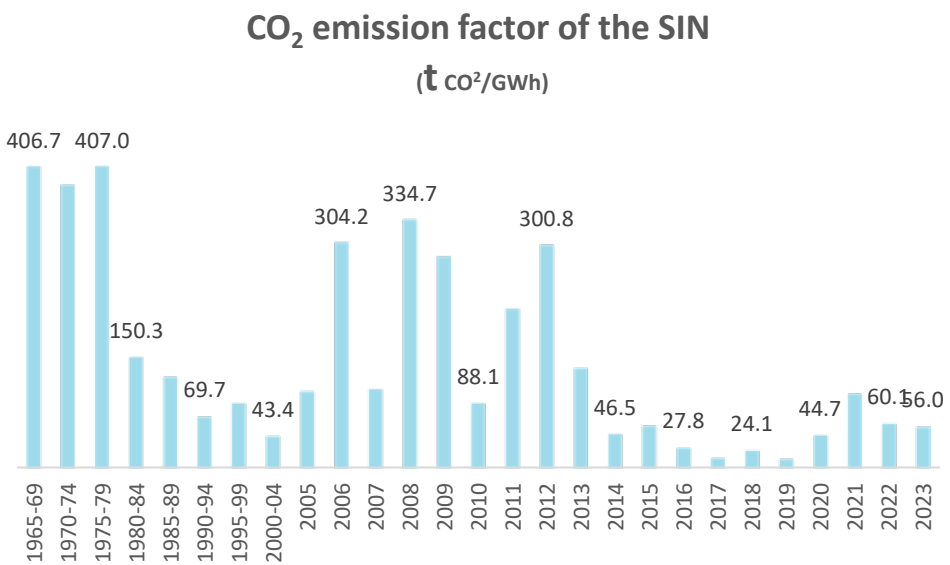
The very strong incorporation of generation plants based on wind and solar resources has allowed Uruguay to systematically rank second globally, after Denmark, in terms of the share of variable renewable sources in 2021.

This is valid even though the participation of solar resources began relatively late (2013), once the costs associated with this technology became convenient for the national electricity system.

Uruguay is the second country in the world in the share of variable renewable sources of electricity (wind and solar).

Uruguay

DECARBONIZATION HISTORY (VI)



Source: BEN: National Energy Balance (2024)

The energy policy implemented in the country has also become an important environmental policy.

On the one hand, it has enabled a significant reduction in greenhouse gas (GHG) emissions by minimizing the use of fossil fuels in the electricity matrix.

At the same time, electricity generation from biomass has enabled waste from the forestry chain (both sawn timber and black liquor), rice husks, sugar cane bagasse, and even solid urban waste to be recovered in this way.

From the global environmental point of view, Uruguay has achieved a substantial reduction in the GHG emission factor of the SIN associated with its internal demand, reaching an average of 44.4 t carbon dioxide(CO_2) /GWh in the last decade.

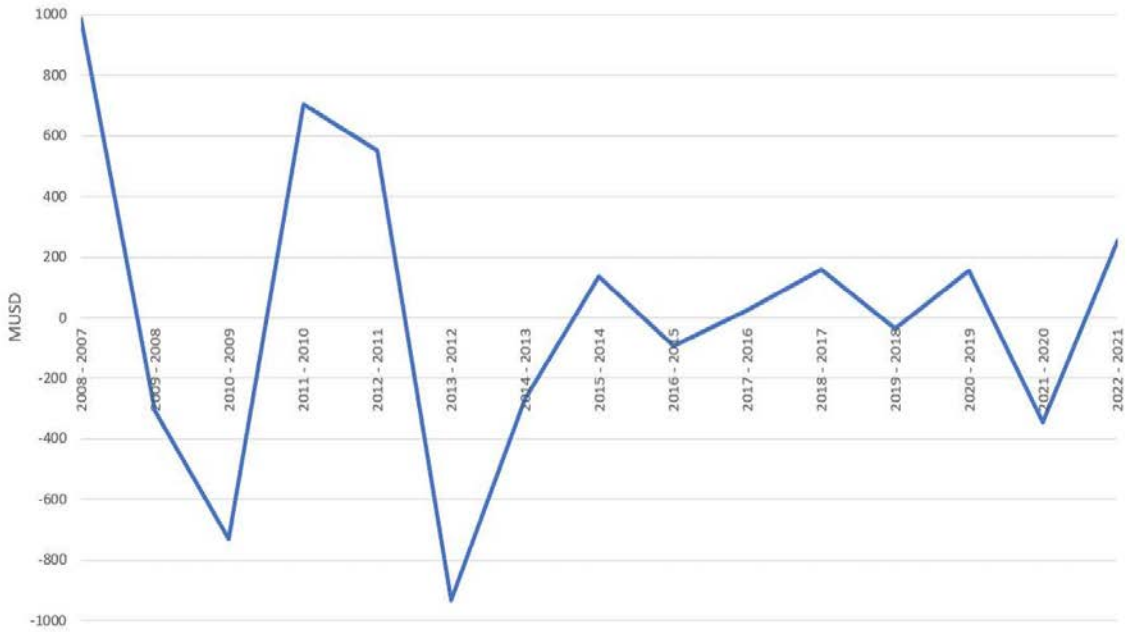
Locally, generation from biomass waste has allowed the recovery of almost 30% of industrial and agro-industrial waste.

Uruguay

DECARBONIZATION HISTORY (VII)

The economic impact of the transformation has been evaluated from an economic point of view, concluding that the system savings have been significant of the average demand sourcing cost.

On the other hand, part of the benefits obtained in the transition of the electricity matrix have been transferred to tariffs. For example, the residential tariff has been reduced by 30% in real terms as a result of the transformation (National Energy Balance).



Annual variability of demand sourcing cost (USD)

Source: BEN: National Energy Balance (2024)

The transformation of the electricity sector has been additionally economically convenient for both the system and the users.

Uruguay

DECARBONIZATION HISTORY (VIII)

Avoiding new power plants through energy efficiency: National Energy Efficiency Law (18597) approved in 2009, one of the first ones in Latin America.

The Law establishes, among others, the creation of: the **Energy Efficiency Trust Fund**, the **National Energy Efficiency Plan** with a national **energy savings target**, and the **Energy Efficiency Certificates**. The **Energy Efficiency Trust Fund** was established in 2012 by Decree 86/12 to finance the Energy Efficiency Certificates, the national energy efficiency labeling system, and several other energy efficiency programs.

The first **National Energy Efficiency Plan 2015-2024** establishes broad policy actions and specific sectoral actions to promote the efficient reduction of the national energy demand and achieve the national energy savings target.

Source: National Energy Efficiency Plan (2015)

The **Energy Efficiency Certificates** (white certificates) provide monetary awards to energy efficiency measures in all sectors according to their energy efficiency savings.

Energy efficiency as a national policy

Uruguay

DECARBONIZATION HISTORY (IX)

Regulation changes have been necessary to adapt the electric sector to the high share of renewable sources in the electric system.

Some of the aspects of these regulation changes are:

- Recognition of firm capacity to renewable sources
- Mechanism to manage curtailment
- Rules to dispatch renewable sources
- Tariffs that recognize the hourly costs
- Other incentives to promote load shifting from peak hours to off-peak hours as well as to increase demand through electrifying uses (cooking, heating, transport, etc.).

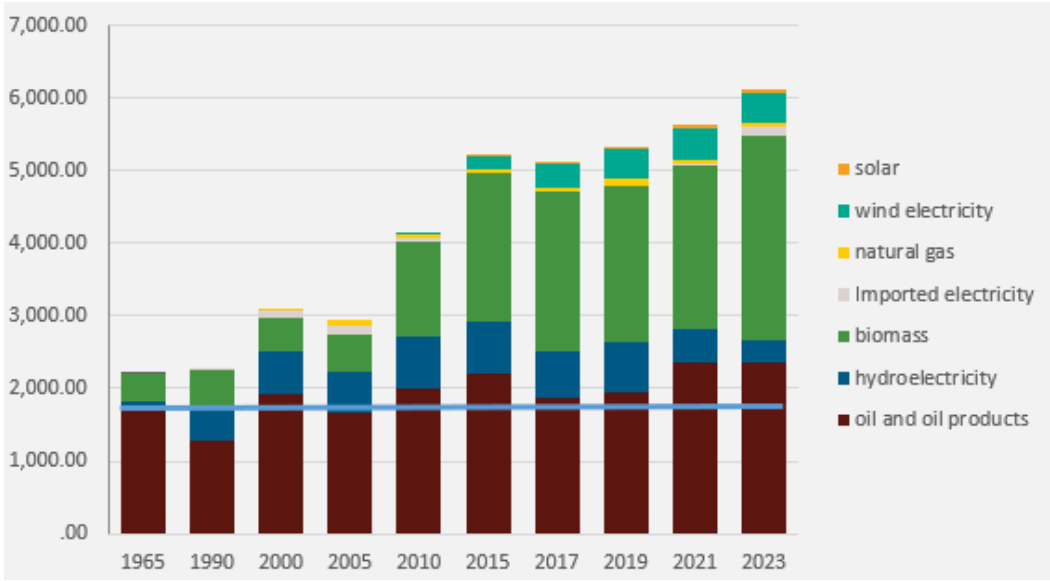
Uruguay

DECARBONIZATION HISTORY (X)

As a consequence of the actions taken, Uruguay's consumption of oil and oil derivatives (measured in physical volume of oil) is now similar to that of 1965 (the first year in which official statistics on the sector were compiled through the National Energy Balance).

At the same time:

- The population grew by 32%.
- The economy almost quadrupled (in constant pesos).
- The number of vehicles increased exponentially.



Energy Consumption by Source (kWh)

Source: BEN: National Energy Balance (2024)

Uruguay today consumes only 33% more oil and oil derivatives than in 1965.

Uruguay

DECARBONIZATION PLAN (I)

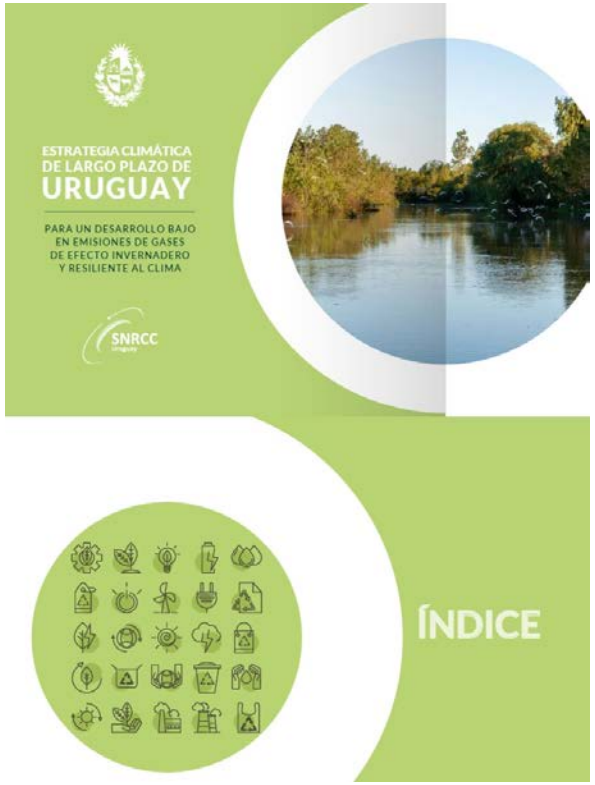
In 2017, Uruguay presented its first nationally determined contribution (NDC) with 20 targets for reducing emissions intensity and maintaining carbon stocks on land and 106 measures in various sectors, including mitigation, adaptation, capacity building, and knowledge-generation measures. In 2020, Uruguay created the Ministry of Environment, which increased the relevance of environmental aspects and took charge of the execution of the national environmental policy, environmental planning, sustainable development, and the conservation and use of natural resources.

In 2022, Uruguay presented its second NDC, which brings together the main measures to be implemented to increase the country's capacity to adapt to climate change and includes Uruguay's contribution to the mitigation of GHGs, setting targets in terms of absolute emissions in relation to meat production, specific targets for conservation and increase of carbon stocks with respect to land use, and measures that allow progress towards these targets.

NDCs and Uruguay’s Long-Term Climate Strategy are the reference frameworks for actions that contribute to the decarbonization of the economy from the energy sector.

Uruguay

DECARBONIZATION PLAN (I CONT.)



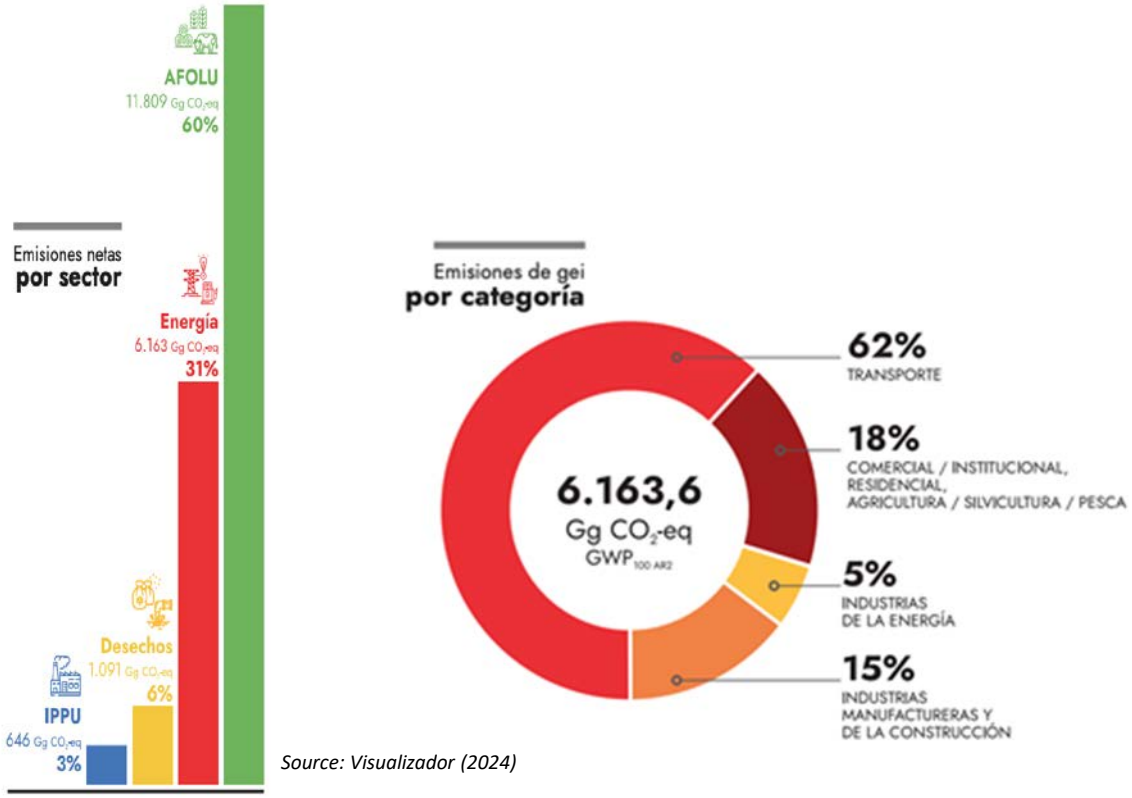
Considering that the basis of the national agreement on climate change in Uruguay is the National Policy on Climate Change, which establishes general strategic guidelines for the response to climate change, and considering that the NDCs aim to implement measures in short timeframes, Uruguay's Long-Term Climate Strategy seeks to project possible scenarios, taking into account future generations and reinforcing the various commitments made by the country, as part of a process of construction and implementation of a state policy on climate change.

The Long Term Climate Strategy (LCS) aims to reflect Uruguay's long-term "aspirational" vision on climate change, both in terms of adaptation and resilience as well as emissions and removal of GHGs to show how the country contributes to the objectives of the Paris Agreement.

NDCs and the Long-Term Climate Strategy are the reference frameworks for actions that contribute to the decarbonization of the economy from the energy sector.

Uruguay

DECARBONIZATION PLAN (II)



Source: Visualizador (2024)

Uruguay has an atypical GHG emissions profile due to its production matrix (strong participation in the economy of the primary sector, mainly livestock).

Within the energy sector: Despite the effort already made to decarbonize the electricity matrix, it is possible that some sectors are still challenging.

The sectors that present the main opportunities are:

- Transport
- Industry.

Transport and industry are the sectors the energy sector has prioritized in order to deepen the decarbonization process of the Uruguayan economy.

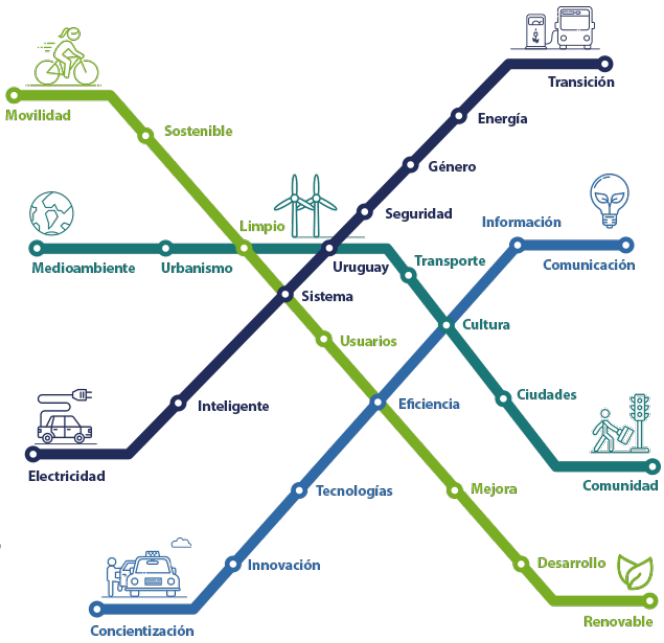
Uruguay

DECARBONIZATION PLAN (III)

Approximately 60% of CO_2 emissions in the energy sector come from the transport sector.

Actions to decarbonize the transport sector include reducing emissions from the energy sources used and changes in modes of transport. The main milestones are:

- **2007**: Approval of the Agrofuels Law (EtOH and biodiesel)
- **2014**: Energy Efficiency Plan - Transport Chapter
- **2017**: Movés Project (electric mobility in the public sector)
- **2018**: Start of inter-institutional work (public sector) on green hydrogen
- **2021**: Subite Program for the incorporation of electric vehicles (motorcycles, cargo tricycles, buses in the different departments of the interior of the country, taxis, private hire vehicles, app-based vehicles, and utility vehicles)
- **2022**: Roadmap for green hydrogen and derivatives in Uruguay
- **2023**: Benefits for private entities to install public access chargers
- **2024**: Trust Fund for Sustainable Mobility, which will facilitate the transition of public transport to clean energy
- **2024**: Electric Route, a charger every 50 km (300 charging points throughout the country).



Source: MIEM (2024)

Uruguay

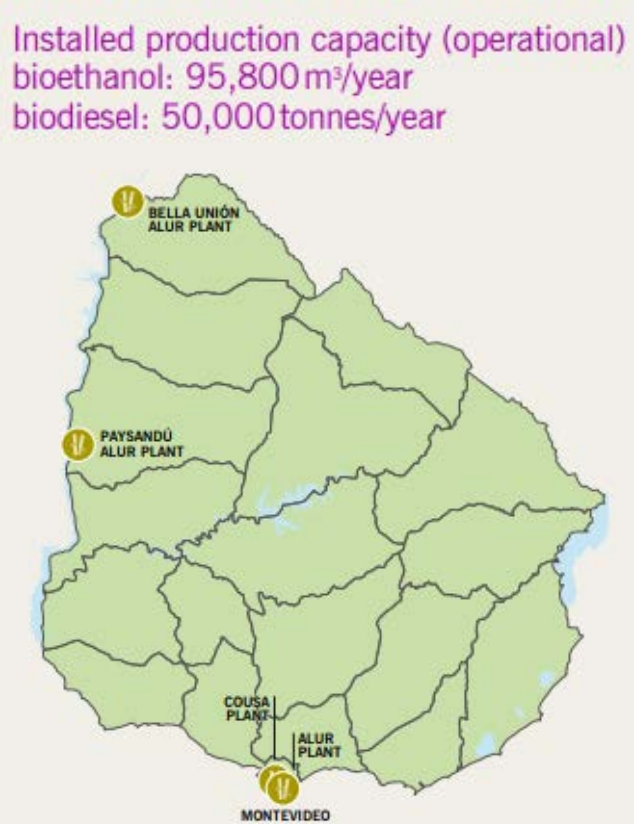
DECARBONIZATION PLAN (IV)

Biofuels

As of 2010, the National Energy Balance (BEN) has included biofuels production and consumption, mainly used in gasoline and gas oil blends within the transport sector. Law 18.195 (November 14, 2007) and its Regulatory Decree 523/008 (October 27, 2008) provided the legal framework for agrofuel production, commercialization, and use in the country.

As for **bioethanol production**, Alcoholes del Uruguay S.A (ALUR) currently has two bioethanol production plants located in the north of the country. Since 2006, ALUR has been managing the sugar factory of the Limited Agrarian Cooperative of Northern Uruguay (CALNU) cooperative in Bella Unión (Artigas department) through an energy and food project that involved an industrial investment plan for the assembly of a distillery for ethanol production, among other measures. This agriculture-energy-food complex produces bioethanol, sugar, electric energy, and animal feed, mainly from sugarcane juice and molasses, as well as sweet sorghum juice (albeit to a lesser extent) . According to data supplied directly by the company, the capacity of this plant is 120 m^3/day of bioethanol, and it operates from May to October. The plant has operated at higher than nominal capacity (140-190 m^3/day) on several occasions.

Furthermore, in October 2014, a new ethanol production plant was inaugurated in Paysandú department, with an installed capacity of 70,000 m^3/year.



Source: IMPO (2007)

Uruguay

DECARBONIZATION PLAN (IV)

Biofuels

As for **biodiesel production**, ALUR has two industrial complexes located in Montevideo department. Plant N°1 is located in Paso de la Arena and has a biodiesel production capacity of 18,000 m^3/year from refined oil, used frying oil, and beef tallow. Glycerin is also produced as a byproduct. This plant is not currently operating. Plant N°2, currently operating, is located in Capurro and has a biodiesel installed capacity of 62,000 m^3/year, generated from vegetable oil, used frying oil, and beef tallow. The products are biofuel, olein, and glycerin.

In 2015, the industrial processes of plants No. 1 and No. 2, along with the final product, received certification under the European standard *International Sustainability and Carbon Certification* for the production of biodiesel from frying oil and tallow.

In 2021, Law 19,996 repealed Article 7 of the Agrofuels Law described above. Consequently, the obligation to blend biodiesel in gas oil ceased to exist. In this context, starting from January 1, 2022, the National Fuel, Alcohol and Portland Administration (ANCAP), decided to decrease the biodiesel blending level to 2.5% in gas oil. From December of that year, no blending volume was recorded.

Installed production capacity (operational)
bioethanol: 95,800 m^3/year
biodiesel: 50,000 tonnes/year

Source: IMPO (2007)

Uruguay

DECARBONIZATION PLAN (V)

1. Inter-institutional lines of work

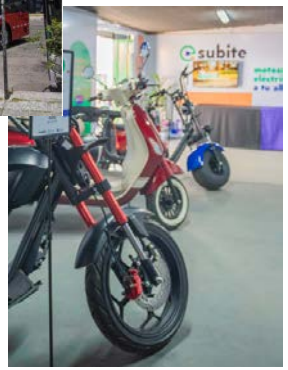
Interinstitutional Group on Energy Efficiency in Transportation: Ministries of energy, transport, environment, economy; road safety agency, budget bureau, local governments, etc.

Electric mobility

Electric mobility discussion group: Users, importers and sellers associations; manufacturers, transport-related chambers, academy, and any related agent.

2. Buying and operating electric vehicle incentives

- Fiscal/tax incentives for electric and hybrid vehicles
- Specific programs: Subite
- Energy Efficiency Certificates
- Sector-oriented programs: Mypimes, Localidades Eficientes.



3. Training, research and development, dissemination, and events

- Training center, Technological University of Uruguay-UTEC courses, profile design, courses for firefighters
- Research and development: FSE, International cooperation, Movés, Euroclima+
- Technology awareness campaigns, Electric Mobility International Forum.

Uruguay

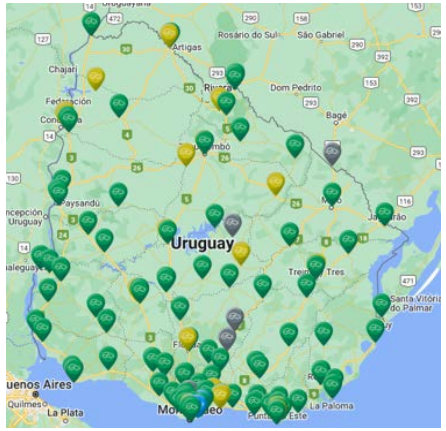
DECARBONIZATION PLAN (V CONT.)

4. Public charging network

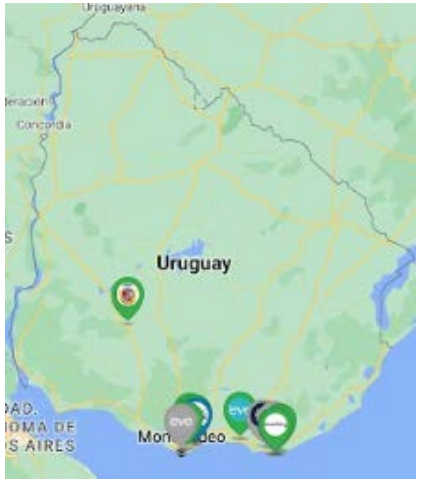
- The National Administration of Power Plants and Electrical Transmission (UTE)
- charging network strategy: a charger every 50 kms
- AC chargers network nationwide, +190 chargers installed
- DC fast charging +100 installed
- Public charging networks from private owners–still incipient.

Electric mobility

UTE



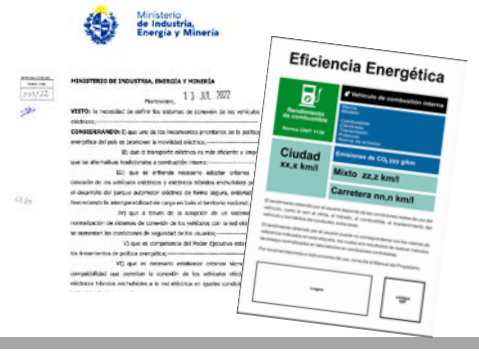
EVE-MOVE



Source: Movilidad Electrica (2024)

5. Regulations

- Minimum technical requirements for chargers—Decree N° 225/022
- Guidance on the conditions for providing public charging services—Resolution N° 174-22
- Economic incentive for public-access DC fast chargers developed by private initiative
- Energy efficiency labeling for vehicles—mandatory for combustion from September 2024
- Sustainable mobility trust for public transport.



Uruguay

DECARBONIZATION PLAN (V CONT.)

Electric mobility

6. Interoperability considerations today

- The public charging network has yet to develop in Uruguay.
- There is an ever-growing increase in electric vehicle sales.
- There are already public and private actors. The interoperability service manager role has become especially relevant.
- Relevance of implementing interoperability on time: minimizing communication problems, compatibility problems, avoiding bad user experience with multiple charging apps, payment methods, among others.
- Regulations must accompany the changes and innovations that are being processed: an environment of high uncertainty.

To be discussed:

- Are new mechanisms necessary to support interoperability development?
- What actions should to be taken for an integrated and optimized development of private and public charging infrastructure?
- How to ensure equitable and nondiscriminated access to interoperable charging infrastructure throughout the national territory?

Uruguay

DECARBONIZATION PLAN (VI)

Monitoring, Verification, and Reporting of Compliance With NDC I

Año medicion	medida	meta	Ult valor disponible	unidad	estado	% Avance
2020	Piloto viviendas Montevideo	100	100	Porcentaje	Meta Alcanzada	100
2023	Utilitarios Eléctricos - Incondicional	150	725	Unidades	Meta Alcanzada	483
2022	Etiquetado Edificaciones	100	50	Porcentaje	En Implementación	50
2023	Ómnibus Eléctrico - Incondicional	15	45	Unidades	Meta Alcanzada	300
2022	Red Recarga Rápida - Otros	100	140	Porcentaje	Meta Alcanzada	140
2023	Piloto Medidores Inteligentes	100000	1000000	Unidades	Meta Alcanzada	1000
2022	Etiquetado vehículos livianos	100	50	Porcentaje	En Implementación	50
2022	Etiquetado Lámparas	100	50	Porcentaje	En Implementación	50
2020	Redes Inteligentes en dos Barrios - Otros	100	100	Porcentaje	Meta Alcanzada	100
2022	Ruta Eléctrica Colonia - Chuy	100	431	Porcentaje	Meta Alcanzada	431
2019	Etiquetado Calentador Agua	100	100	Porcentaje	Meta Alcanzada	100
2017	Etiquetado Aire Acondicionado	100	100	Porcentaje	Meta Alcanzada	100
2017	Etiquetado Heladeras	100	100	Porcentaje	Meta Alcanzada	100
2021	LED Alumbrado Público - Incondicional	30	59	Porcentaje	Meta Alcanzada	197
2013	Sustitución Lámparas Incandescentes	4000000	5514271	Unidades	Meta Alcanzada	138
2022	Biodiesel - Incondicional	5	0.6	Porcentaje	En Implementación	12
2022	Generación eléctrica biomasa	160	176.4	Mega Watt	Meta Alcanzada	110
2022	Colectores Solares - Incondicional	50	86.8	Mega Watt tér	Meta Alcanzada	174
2022	Generación eléctrica solar	220	280	Mega Watt	Meta Alcanzada	127
2022	Certificados sector consumo	100	100	Porcentaje	Meta Alcanzada	100
2022	Bioetanol - Incondicional	5	9.5	Porcentaje	Meta Alcanzada	190
2023	Taxis Eléctricos - Incondicional	150	152	Unidades	Meta Alcanzada	101
2022	Generación eléctrica biomasa autoconsumo	250	241	Mega Watt	En Implementación	96
2022	Anillo Red Eléctrica - Incondicional	100	75	Porcentaje	En Implementación	75
2022	Generación eléctrica eólica	1450	1517	Mega Watt	Meta Alcanzada	105
2022	Ruta Eléctrica Nacional - Otros	100	167	Porcentaje	Meta Alcanzada	167

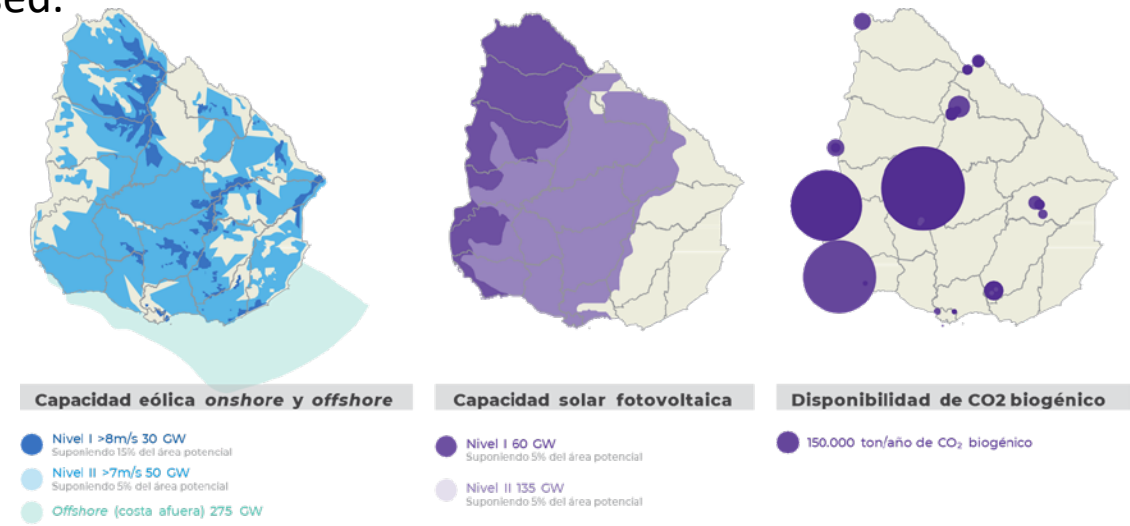
Uruguay

DECARBONIZATION PLAN (VII)

Green hydrogen

After a process of analysis and exchange with relevant actors at the national and international levels, stakeholders concluded that Uruguay has very good conditions for the development of green hydrogen and derivatives.

This is due to Uruguay's large amount of renewable energy sources and biogenic CO_2, as well as its institutional stability and strong democracy. It is based on this conclusion that the present roadmap to 2040 is proposed.



Uruguay

DECARBONIZATION PLAN (VIII)

The roadmap for green hydrogen and its derivatives foresees its development in three phases:

The first phase, aims to learn from the development of the first pilot projects, specifically the development of missing regulations, the planning of infrastructure to be developed, and dialogue with the communities that will receive the projects.

The second phase is initiating large-scale production of hydrogen and derivatives, followed by a third phase in which the development of new export infrastructure allows for the incorporation of new derivatives for export (e.g., NH_3).

Uruguay

DECARBONIZATION PLAN (IX)

Uruguay's roadmap for green hydrogen and its derivatives sets out an ambition for the road to 2040 that can be summarized in the following figures:

Uruguay

II. BUILDING

Action Plan for Rapid Decarbonization of the Power Sector

CLEAN ENERGY MINISTERIAL
Advancing Clean Energy Together

Uruguay

CLIMATE CHANGE INDICATOR INDEX-LINKED BOND

The **Climate Change Indicator Index-Linked Bond** Framework aligns Uruguay's sovereign financing strategy with its climate and nature conservation objectives, based on the commitments made in the Paris Agreement.

It outlines Uruguay's sustainable strategic priorities and sets targets for Key Performance Indicators, linked to the evolution of GHG emissions intensity and the area of native forests.

The performance targets are based on the quantitative targets set by Uruguay in its NDC.

Indicadores de desempeño

KPI-1: Reducción en el total de emisiones brutas de GEI (en CO2 equivalente) por unidad de PIB real, respecto al año de referencia (en %)

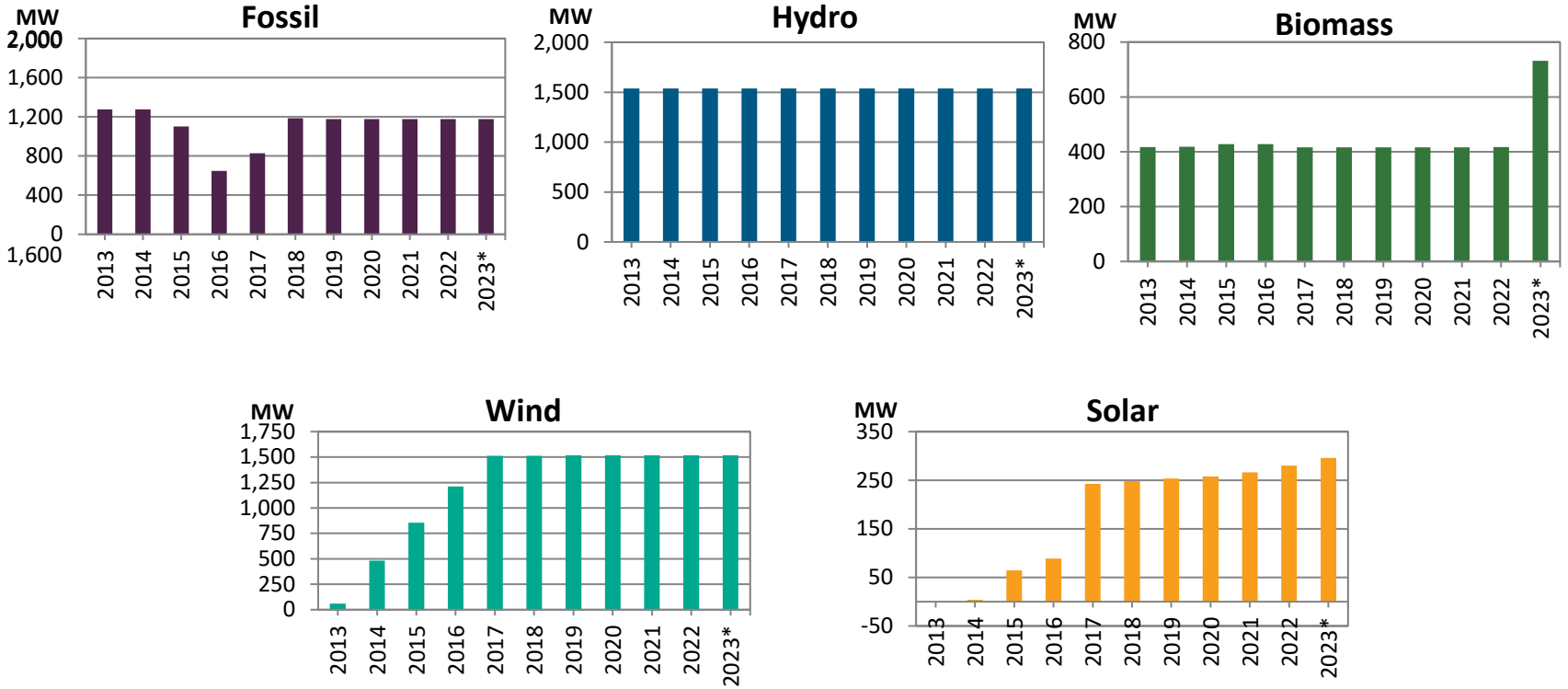
KPI-2: Mantenimiento del área de bosque nativo (en hectáreas), respecto al año de referencia (en %)

Uruguay

POWER SECTOR INFRASTRUCTURE SNAPSHOT

Summary of main numbers in the sector.

Installed capacity of each source



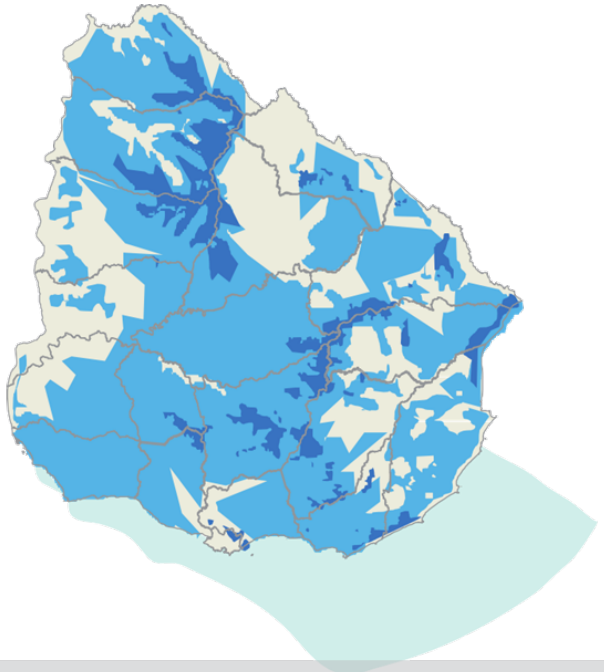
PICO DE VERANO 2023-2024
2201 MW (2024-02-09 15:23:00)
PICO DE INVIERNO 2024
2103 MW (2024-06-04 20:11:10)

Electrification rate: 99.9 %

Source: BEN: National Energy Balance (2023)

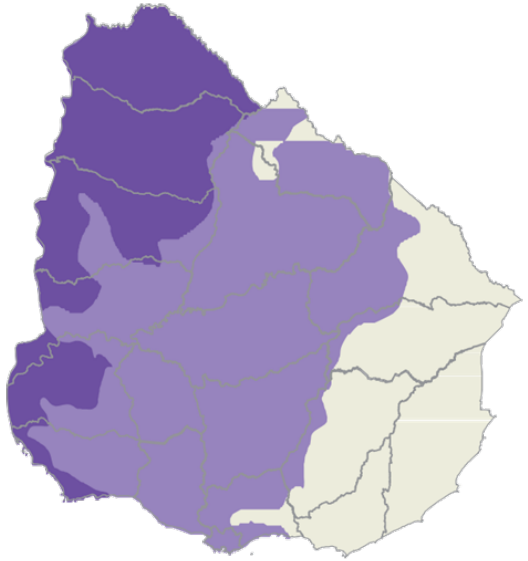
Uruguay

URUGUAYAN RENEWABLE ENERGY RESOURCES (I)



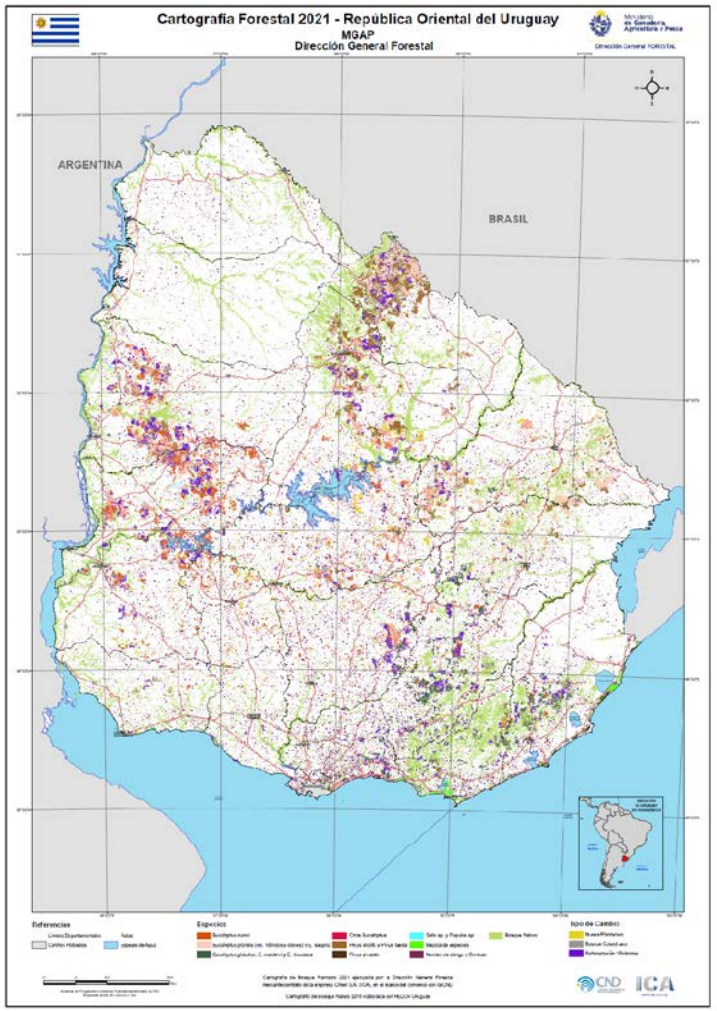
Capacidad eólica *onshore* y *offshore*

- Nivel I >8m/s 30 GW
  Suponiendo 15% del área potencial
- Nivel II >7m/s 50 GW
  Suponiendo 5% del área potencial
- *Offshore* (costa afuera) 275 GW



Capacidad solar fotovoltaica

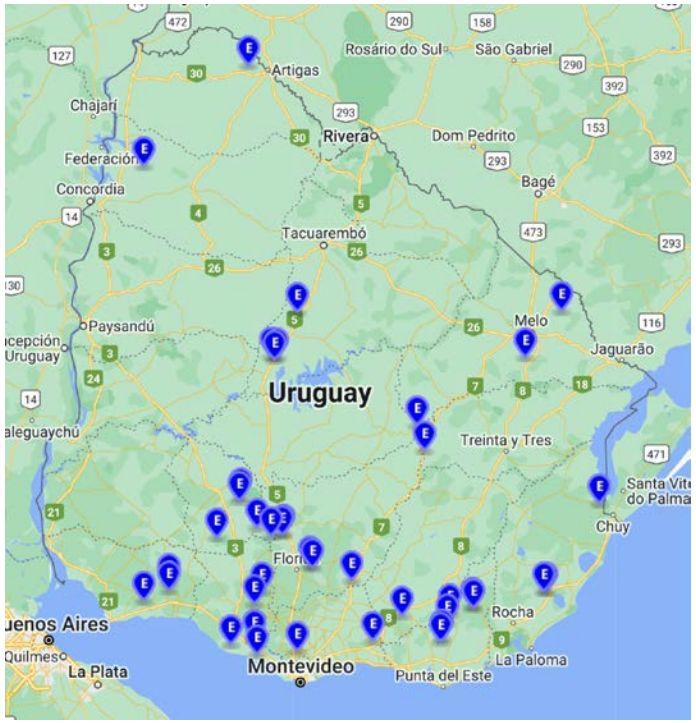
- Nivel I 60 GW
  Suponiendo 5% del área potencial
- Nivel II 135 GW
  Suponiendo 5% del área potencial



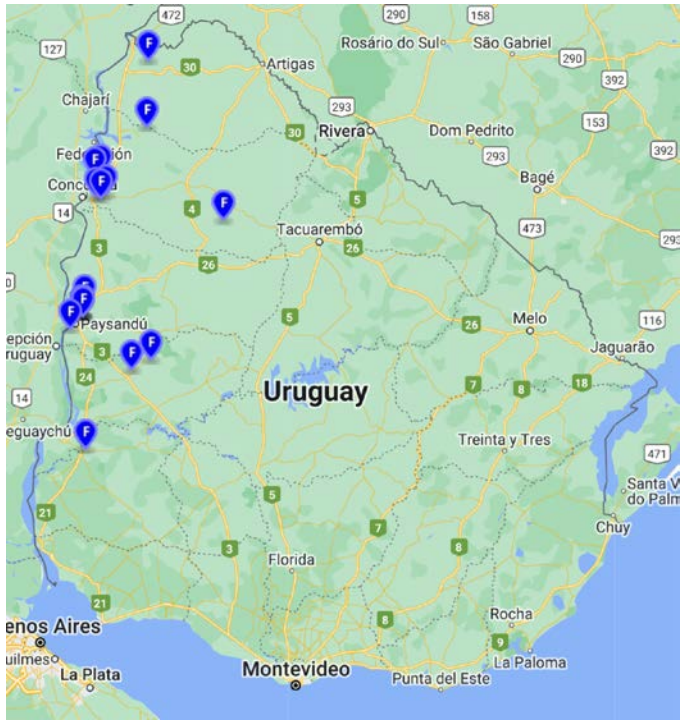
Source: MIEM (2024)

Uruguay

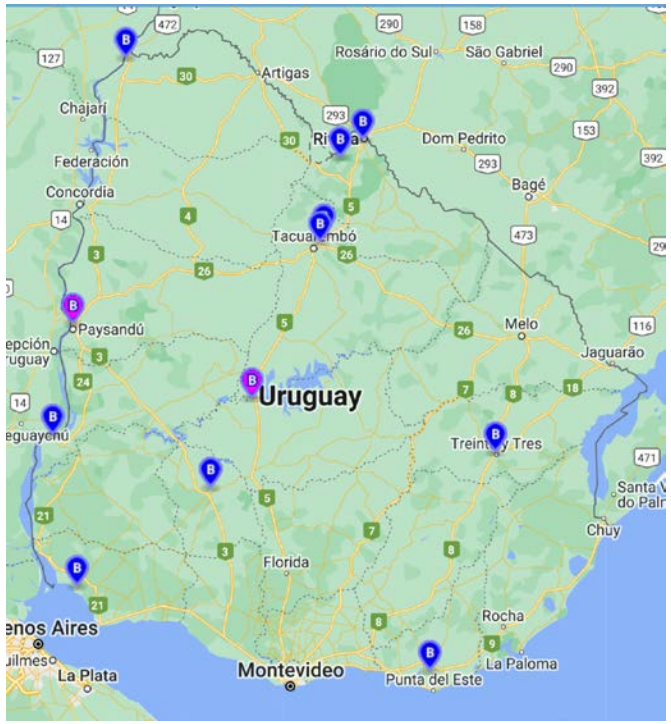
URUGUAYAN RENEWABLE ENERGY RESOURCES (II)



Operating power plants:
Wind energy



Operating power plants:
Solar photovoltaic



Operating power plants:
Biomass

Source: UTE (2024)

Uruguay

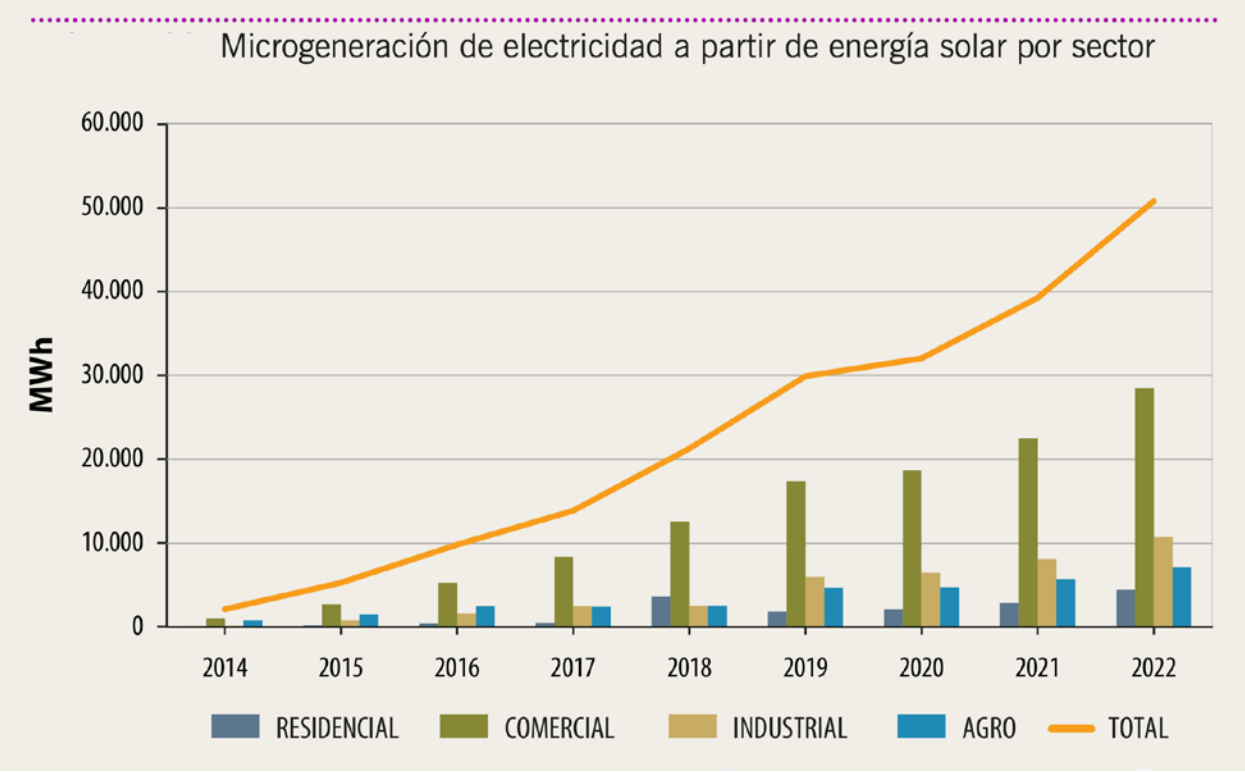
URUGUAYAN RENEWABLE ENERGY RESOURCES (III)

Prosumer Development

Solar microgeneration accounts for **99%** of the total.

From 2014 to 2022, there was a significant increase from 2,110 MWh to 50,793 MWh.

The sectoral distribution shows that the commercial and services sector has been the most active (56%), followed by the industry sector (21%) and agriculture (14%) and finally the residential sector (9%).



Source: MIEM (2022)

Uruguay

URUGUAYAN RENEWABLE ENERGY RESOURCES (IV)

General Regulatory Framework for the Regulated Prosumer

Prosumer → the customer who owns a supply made and measured by the distributor that generates electrical energy for its own consumption.

- The injected electrical energy is remunerated at the hourly spot price.
- The prosumer pays a tariff with charges that differentiate the generation costs and the costs associated with transmission, distribution, and generation backup facilities.

Uruguay

URUGUAYAN RENEWABLE ENERGY RESOURCES (V)

Renewable Energy Certification

Ministerio de Industria, Energía y Minería

MINISTERIO DE INDUSTRIA, ENERGÍA Y MINERÍA

053/21

Montevideo, 06 AGO 2021

VISTO: la conveniencia de implementar un sistema nacional de certificación del origen de la energía eléctrica de fuente primaria renovable (SCER);

RESULTANDO: I) que como consecuencia de la política energética la generación de energía eléctrica de origen renovable ha experimentado un importante desarrollo que ha posibilitado la transformación de su matriz eléctrica y ha aportado robustez a la matriz energética nacional;

II) que entre los años 2010 y 2016 el país realizó una importante inversión en infraestructura energética y actualmente en un escenario de hidraulicidad media es esperable que en el entorno del 98% de la energía eléctrica se genere a partir de fuentes renovables;

III) que la generación de energía renovable contribuye al cuidado del medio ambiente, mitigando emisiones de gases de efecto invernadero y reduciendo el impacto de las actividades tradicionales de generación mediante el uso de combustibles fósiles;

IV) que actualmente en el país se cuenta con información confiable respecto de la disponibilidad de los recursos renovables, así como de los aspectos técnicos, económicos y sociales asociados a su aprovechamiento;

Renewable energy certificates are an accreditation mechanism, in electronic format, that ensure that a given number of megawatt-hours of electricity produced in a given period have been generated from renewable sources.

The allocation of certificates per source is calculated from cross-referencing generation, import, and export data with the customer's consumption data.

UTE, as well as other marketers, provide consumption data for the allocation to final consumers.

Renewable energy certificates are registered on Energy Web's blockchain, called the Energy Web Chain. This open-source public blockchain is derived from the Ethereum blockchain technology.

Sistema de Certificación de Energía Renovable Uruguay

Source: MIEM (2024)

Uruguay

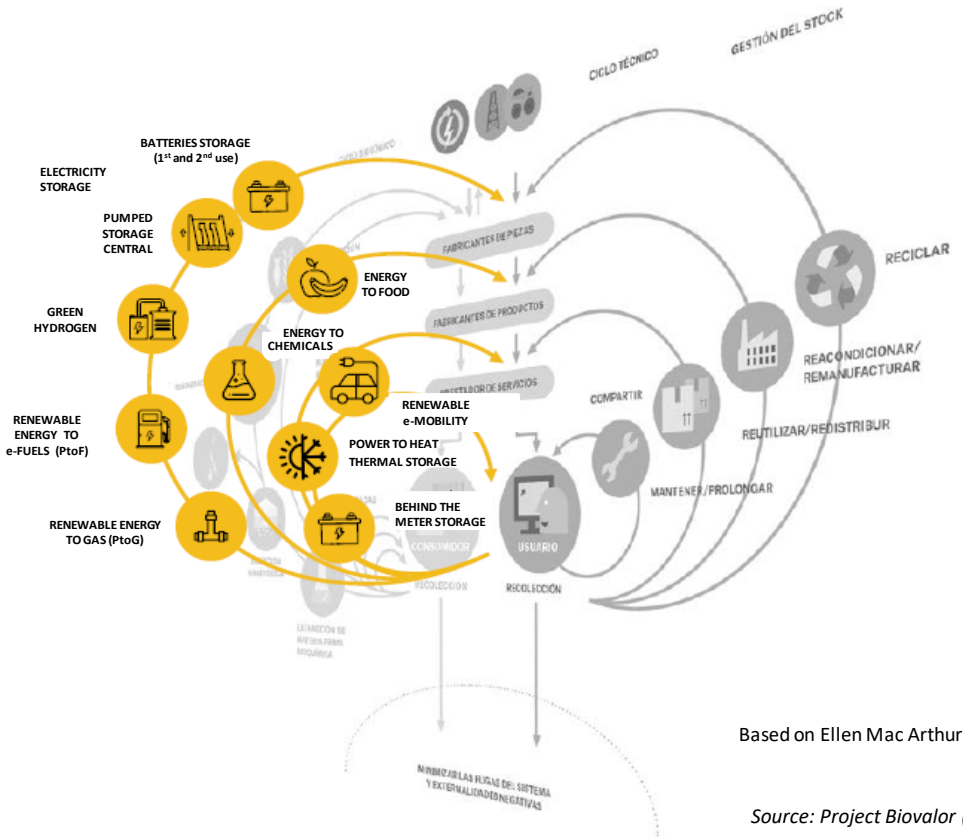
URUGUAYAN RENEWABLE ENERGY RESOURCES (VI)

Renewable Energy Circularity

The application of the energy circularity concept in a country-scale laboratory has been postulated, incorporating a new dimension into the Ellen MacArthur Foundation's proposal of a two-winged butterfly in a three-wing system.

Applying the principles of circular economy and green chemistry, new services (storage, power to heat, and e-mobility), new products (chemicals and food), and new energy vectors (power to gas, e-fuels, green hydrogen, among others) can be deployed from surplus renewable electricity.

Third wing of the circular economy (Renewable energy circularity)

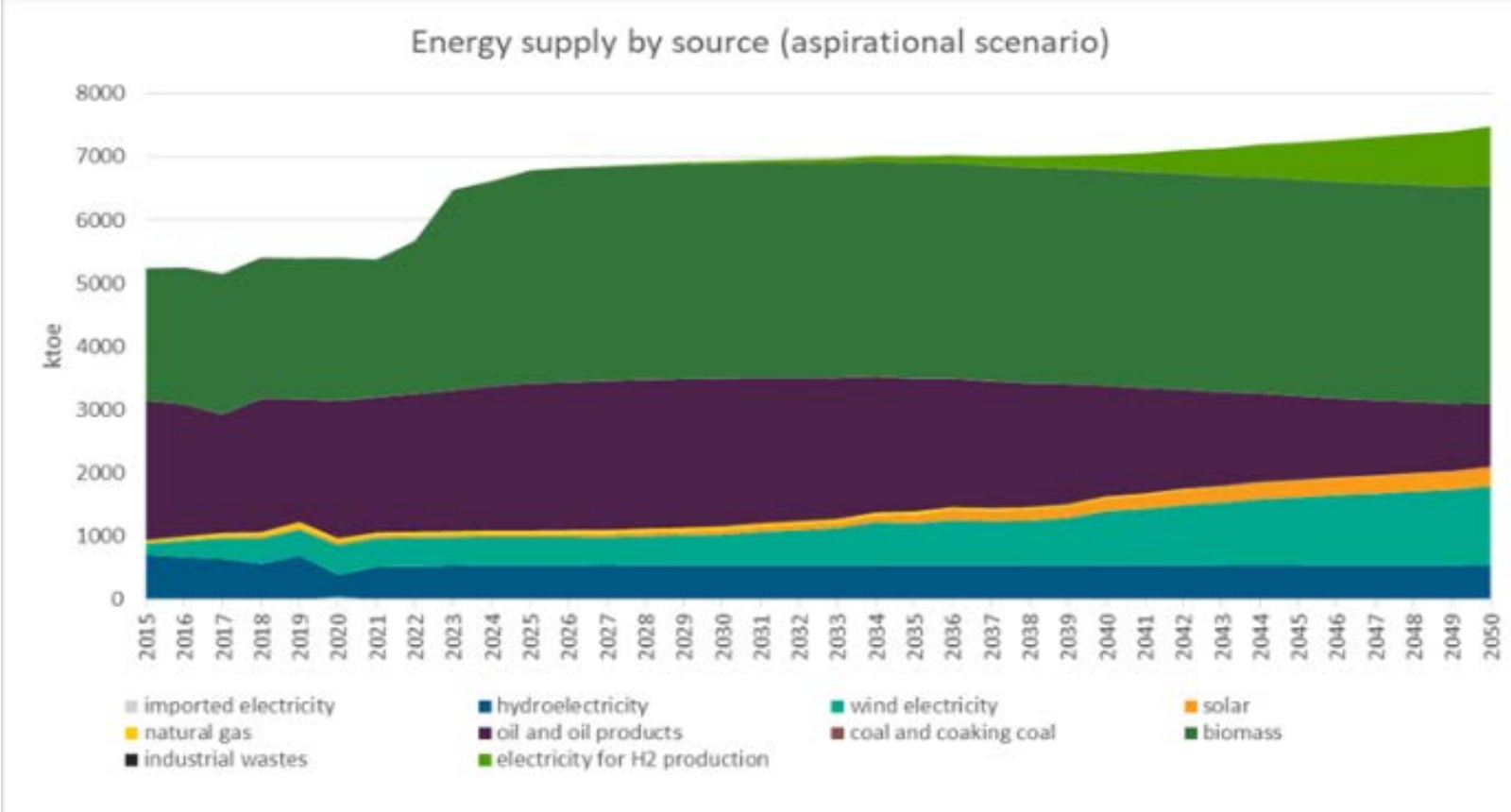


Based on Ellen Mac Arthur Foundation's scheme

Source: Project Biovalor (2020)

Uruguay

HISTORY AND FUTURE OF THE URUGUAYAN ELECTRICAL SYSTEM



Source: MIEM (2024)

Uruguay

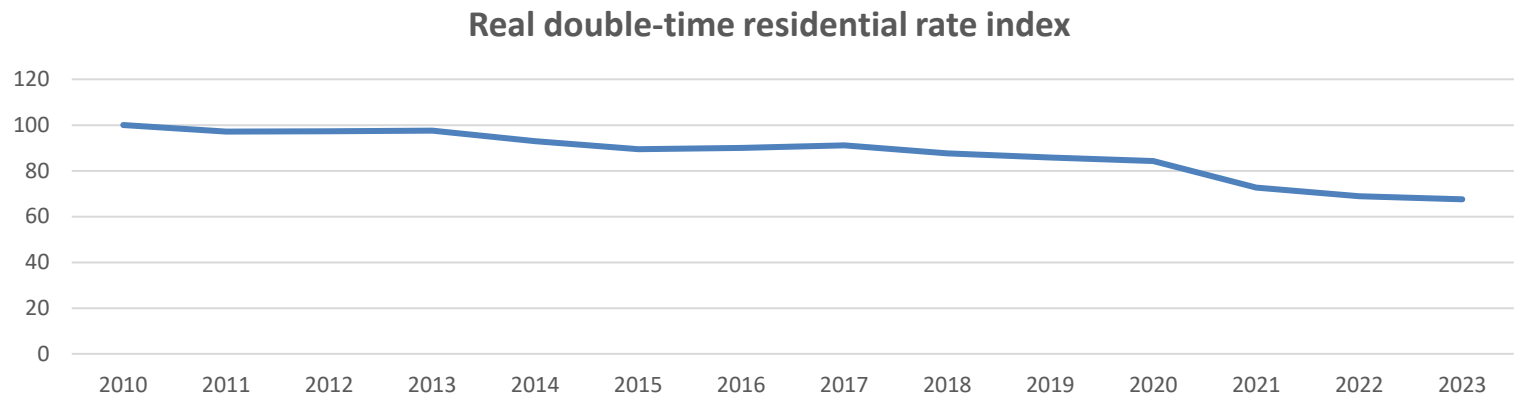
III. OPERATING

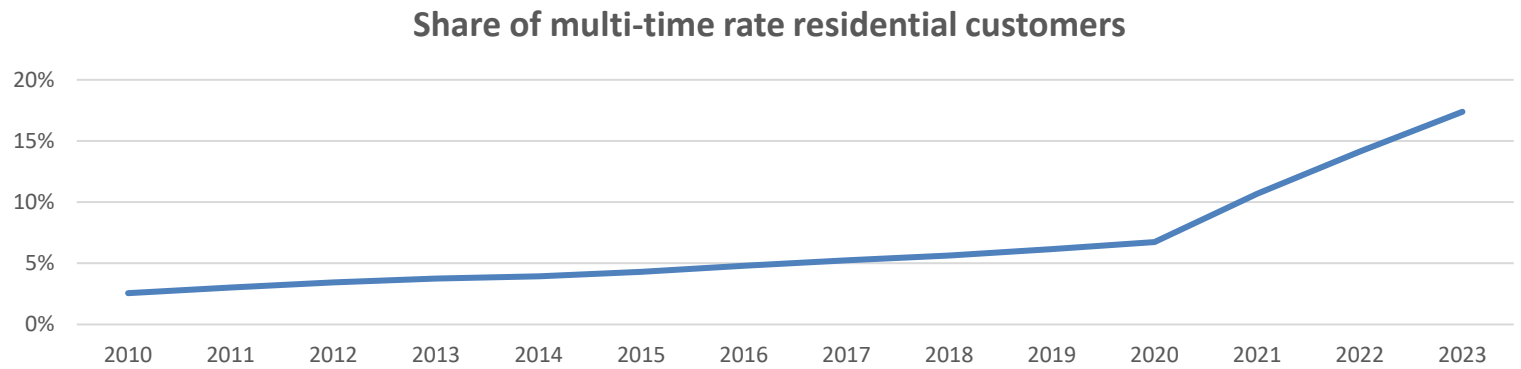
Action Plan for Rapid Decarbonization of the Power Sector

CLEAN ENERGY MINISTERIAL
Advancing Clean Energy Together

Uruguay

HISTORICAL EVOLUTION OF MULTI-TIME RESIDENTIAL RATE



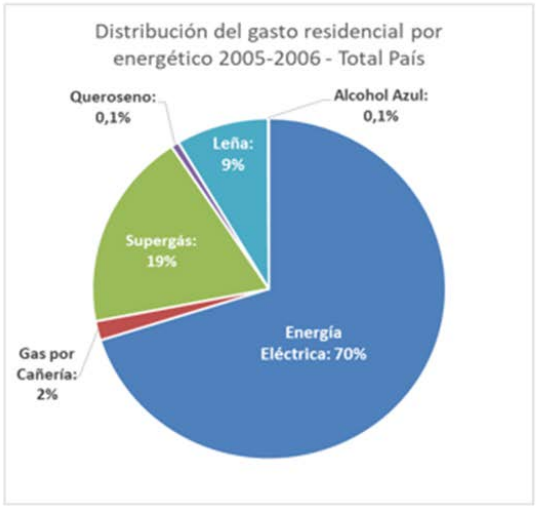


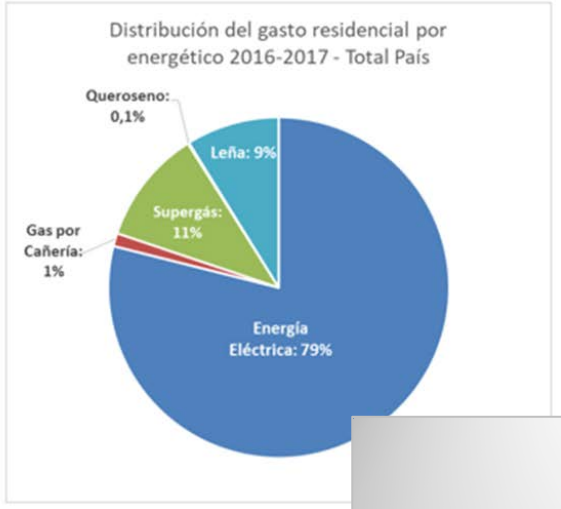
Source: FERC, 2022

Uruguay

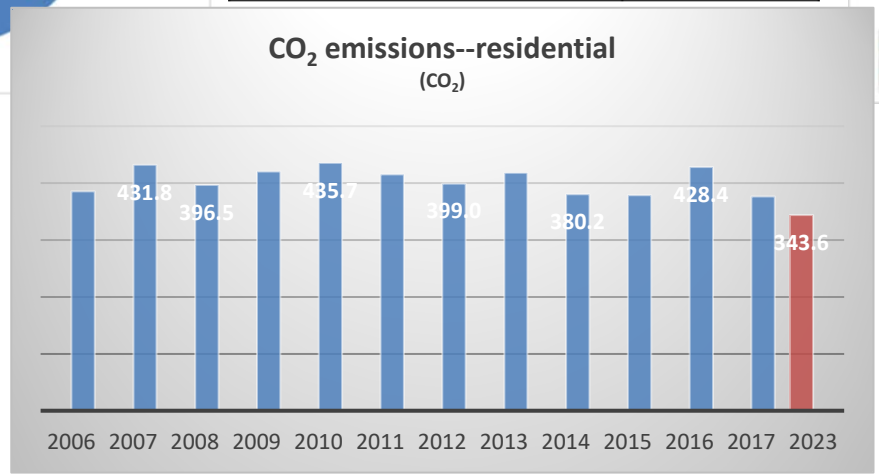
STAKEHOLDER ENGAGEMENT AND INCLUSION

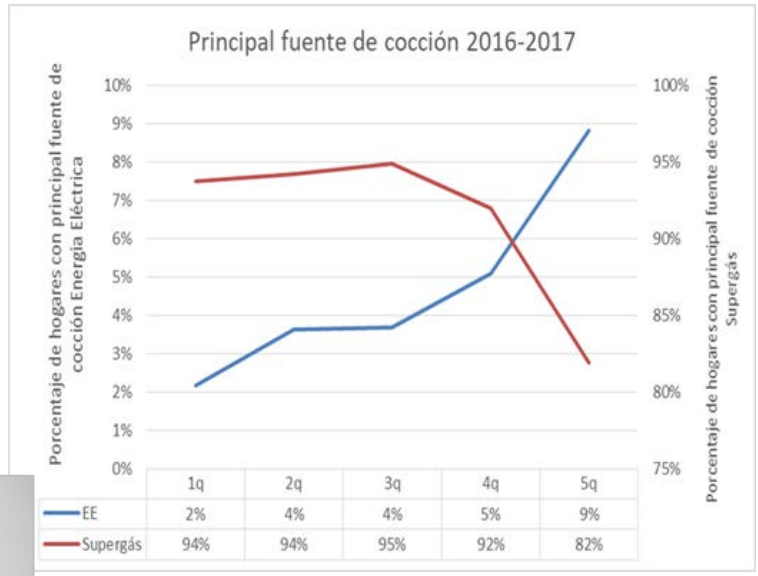
Demand side: Energy poverty study with Economic Commission of Latin America and the Caribbean- ECLAC, decarbonization without increasing energy costs. Work based on the expenses and income survey.





Quintil ingreso	Gasto / Ingreso 2005-2006	Gasto / Ingreso 2016-2017
1q	11,6%	6,9%
2q	8,4%	5,4%
3q	6,9%	4,8%
4q	5,8%	3,9%
5q	3,7%	2,6%
TOTAL / PROML:	5,5%	3,9%

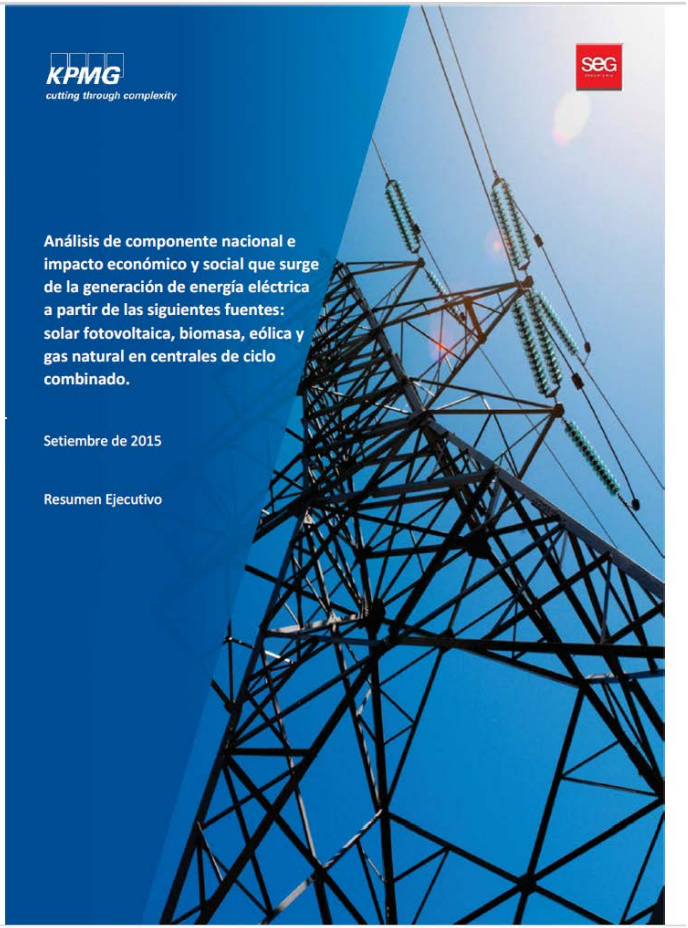




Source: BEN: National Energy Balance (2023)

Uruguay

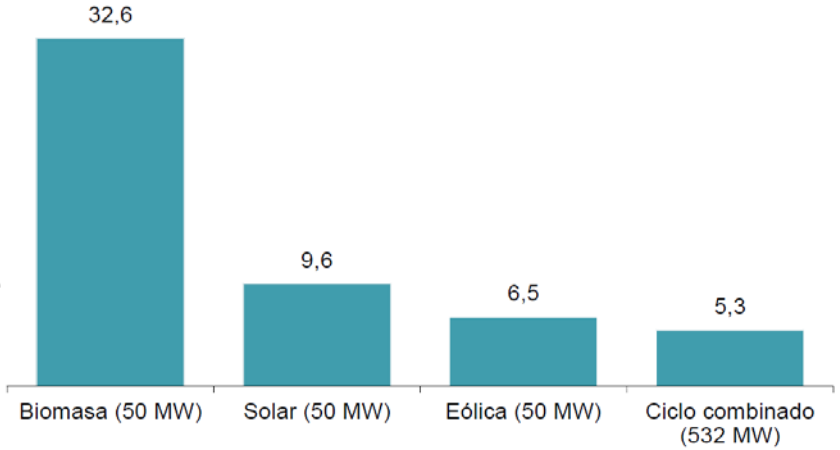
STAKEHOLDER ENGAGEMENT AND INCLUSION



Source: MIEM (2015)

Employment Creation

All actions were oriented to incorporate renewable energies contemplating the development of local capacities. During the competitive processes the participation of local industry components in the investment were considered.



Direct employment creation associated with the construction and operation phase (man-years/MW)

Among other economic impacts, as a consequence of this process, a number of local companies have managed to internationalize when developing similar programs for the incorporation of renewable energies in the region.

This concern is present today when developing initiatives to decarbonize the transport sector (green hydrogen, electric mobility, biofuels, etc.).

Uruguay

Stakeholder Engagement and Inclusion

Capacity Building

Sectoral Energy Fund

The objective of this instrument is to finance research and development and innovation projects that enhance or strengthen the capacities of the national energy sector.

It is aimed at research groups supported by national public or private nonprofit institutions whose activities include research, development, or innovation.

Renewable Energy Operation and Maintenance Training Center

The Training Centre for Sustainable Mobility, Energy Efficiency and Renewable Energies aims to train people from Uruguay and the region in order to develop technical-professional activities in companies in the wind, solar photovoltaic, solar termal, and electric mobility sectors.

At the same time, its mission is to train trainers and operate as a job exchange, connecting companies with qualified people in the sector.

Green Hydrogen Sectoral Fund

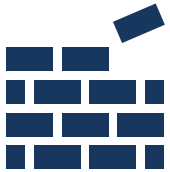
ANII (National Innovation and Research Agency), the Ministry of Industry, Energy and Mining, and the Uruguayan Technological Laboratory created the Green Hydrogen Sectoral Fund, with the aim of financing research, innovation, and training projects in this area. Through this call, funding and support is provided for the construction, production, and use of green hydrogen and its derivatives. Among its uses: heavy-duty transport or buses, e-methanol, e-kerosene, green fertilizers, and blending with natural gas. The support was up to $10 million USD in the form of nonrefundable financing.

Source: ANII (2023) & INEFOP (2024)

Uruguay

Next Steps for Action Plan Implementation

Planning



Building

Operating

Next steps should include:

- Regulation that accompanies the changes
- New proposals for the use of surpluses
- Work on new technologies adoption projects considering technical and economic efficiency aspects.
- Project: **Energy storage (battery energy storage systems)**
  - Based on comparative studies that identified best practices and a roadmap for the Uruguayan case
  - For the near future, two key activities: (1) load studies and battery energy storage system modeling, and (2) technology diffusion/awareness among stakeholders and regulatory framework development.

Uruguay

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Uruguay

URUGUAY'S ACTION PLAN AND EXPERIENCE FOR POWER SECTOR DECARBONIZATION

Ministry of Industry, Energy and Mining

NREL/PR-7A40-91304

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