Energy Balance 2020

Ministerio de Industria, Energía y Minería

BEN
BALANCE ENERGÉTICO NACIONAL URUGUAY

República Oriental del Uruguay
Ministry of Industry, Energy and Mining
National Directorate of Energy

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

You can navigate through this document using the panel on the left.

By clicking on the tables you can download the corresponding spreadsheet.

In order to view it correctly we recommend Adobe Acrobat Reader®. You can download it at the following link: https://get.adobe.com/es/reader/

Energy Balance 2020
Historical series 1965-2020
ISSN electronic format: 2815-6501

Translation into English:
Mg. Lourdes Martino

Design:
Agustín Sabatella

Ministerio
de Industria,
Energía y Minería

BEN
BALANCE ENERGÉTICO NACIONAL URUGUAY

Authorities

President of the Republic
Dr. Luis Lacalle Pou

Minister of Industry, Energy and Mining
Eng. Omar Paganini

Deputy Minister of Industry, Energy and Mining
Walter Verri

National Director of Energy
Lic. Fitzgerald Cantero Piali

The Ministry of Industry, Energy and Mining (MIEM) is responsible for preparing the National Energy Balance. This is done by the Planning, Statistics and Balance Area (PEB) of the National Directorate of Energy (DNE). This publication includes the historical series 1965-2020 and is available online: www.ben.miem.gub.uy

Ministry of Industry, Energy and Mining (MIEM)
www.gub.uy/miem

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Table of contents

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Charts

ALPHABETICAL ORDER

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Tables

ALPHABETICAL ORDER

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Foreword

The National Directorate of Energy (DNE) presents the National Energy Balance (BEN), which includes the main results of the national energy sector for 2020. The BEN aims to provide information to aid in designing and reviewing public policies and issues relative to the energy planning process. It is addressed to all the bodies, companies, and individuals involved in the energy sector. This information is expected to be useful to continue improving decision making in this area.

The BEN 2020 is the 56th balance in the 1965-2020 historical series published without interruption since 1981. Uruguay is one of the few countries in Latin America and the Caribbean to have such an extensive series.

One of the main elements in this Balance is the consolidation of the energy matrix diversification and the high share of local sources. In 2020, local and renewable sources had a 94% share in the electricity generation matrix, although it was a dry year. This resulted in one of the lowest hydroelectricity generation levels. As Uruguay does not produce fossil fuels such as oil, every local source in the country is renewable, contributing to the decarbonization targets of our energy matrix.

Regarding the matrix of energy supply or primary matrix, the share of renewable sources reached 58%, surpassing the targets set. The share of biomass exceeded that of oil and oil products for the fifth consecutive year.

There are no significant infrastructure changes compared to 2019; the variations recorded in 2020 are associated with solar energy. Although the installed capacity of photovoltaic solar energy and solar thermal energy remains low, they have shown sustained growth in recent years. Solar thermal energy grew by 12% in the last year and recorded an installed area of 98,071 m^2, while photovoltaic solar energy grew by 2% and reached 258 MW of installed capacity.

Another landmark in the BEN 2020 is that 48% of the electricity consumed by the industrial sector was generated from autoproduction; that is, the industrial establishments themselves generated almost half the power consumed.

Furthermore, we have improved final consumption estimations by sector through energy consumption and use surveys conducted by DNE-MIEM. Studies conducted in the poultry farms and mining sectors made it possible to disaggregate the consumption of both sectors. This allowed us to correct firewood consumption in the poultry farms sector since it was replaced by LPG. The 2020 balance includes a further improvement: establishing the technical coefficients to determine gas oil consumption in the agricultural sector.

Finally, we would like to acknowledge the official bodies and private institutions that made this work possible with their valuable information.

Lic. **Fitzgerald Cantero Piali**
National Director of Energy

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

1. Introduction

The National Energy Balance (BEN) is a statistical study that gathers information on different energy flows. It includes supply, transformation, and sectoral energy consumption (demand), which is expressed in a common unit and corresponds to one calendar year. It is a necessary tool for energy planning as it shows the structure of energy production and consumption in Uruguay. However, it must be related to other socioeconomic variables to be an efficient decisionmaking tool.

The National Directorate of Energy (DNE) of the Ministry of Industry, Energy and Mining (MIEM) prepares and publishes the annual BEN through the Planning, Statistics and Balance Area (PEB), including information available since 1965. This is how the BEN 2020 completes 56 years of the historical series. Uruguay is one of the few countries in Latin America and the Caribbean to have published such an extensive series of national energy balances in an uninterrupted and public way. This publication continues a series that started in 1981 with the "National Energy Balance - Historical Series 1965-1980" developed with the support and methodology of the Latin American Energy Organization (OLADE).

The presentation of the information has varied significantly over the years. These are the modifications and improvements included in the BEN 2020.

Sectors:

- The agriculture/fishing/mining sector is now called "primary activities."
- Consumption in the agriculture and mining sectors is disaggregated. The BEN 2020 includes a breakdown of the consumption of these sectors as of 2013.
- The agriculture sector was subdivided into "poultry farms" and "other agricultural activities." This balance includes the sectors' disaggregated information for 2019 and 2020.

Sources:

- Wind and solar energy: the concept of "unused" energy is now included to address operational restrictions. Please see the relevant methodology in 8.4.2. This flow is completed for the 2018-2020 series.
- Photovoltaic solar energy is included in public lighting, as well as the nationwide survey on this type of technology.
- Photovoltaic solar energy: the methodology includes four categories, higher or lower than 150kW, and within each category, we have public service and autonomous.
- A new primary energy source is included: "industrial waste." This information is presented disaggregated and since 2011.
- LPG: its sectoral allocation is improved as the ISIC Rev. 4 coding concept was included in the administrative data on the sales of this energy source.
- Lubricants: statistics have improved after including the concept of inputs for lubricant production and their flow in the BEN.
- Gasoil and gasoline: the statistics of backup equipment consumption were improved, and the adjusted series since

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

2016 was developed. This allowed us to estimate better the electricity generated with such equipment. This improvement was mainly based on the information gathered in the industrial sector's 2016 energy use and consumption survey[1].

- Coal: a new NCM (Mercosur Common Nomenclature) heading is included (2706.00.00.00–soft coal tar) as derived from coal, which arises from OLADE's (Latin American Energy Organization) harmonization process. This is a methodological improvement, although it does not have a significant impact on energy.
- Electricity: technical and nontechnical distribution and commercialization losses are corrected according to data updated by UTE for the 2016-2020 series.

It is necessary to compare the figures of the various sources that make up the energy supply, which have different heating values. Therefore, the values are expressed in ktoe (kilotonnes of oil equivalent), so one tonne of oil equivalent (toe) equals 10 million kilocalories. Each source is converted to ktoe using the corresponding Lower Heating Value (LHV).

1- https://www.gub.uy/ministerio-industria-energia-mineria/datos-y-estadisticas/estadisticas/balance-nacional-energia-util-del-sector-industrial-datos-2016

Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

2. Infrastructure of the uruguayan energy system

The infrastructure of the Uruguayan energy system can be described through three main sectors: “power transformation,” “hydrocarbons,” and “biofuels.”

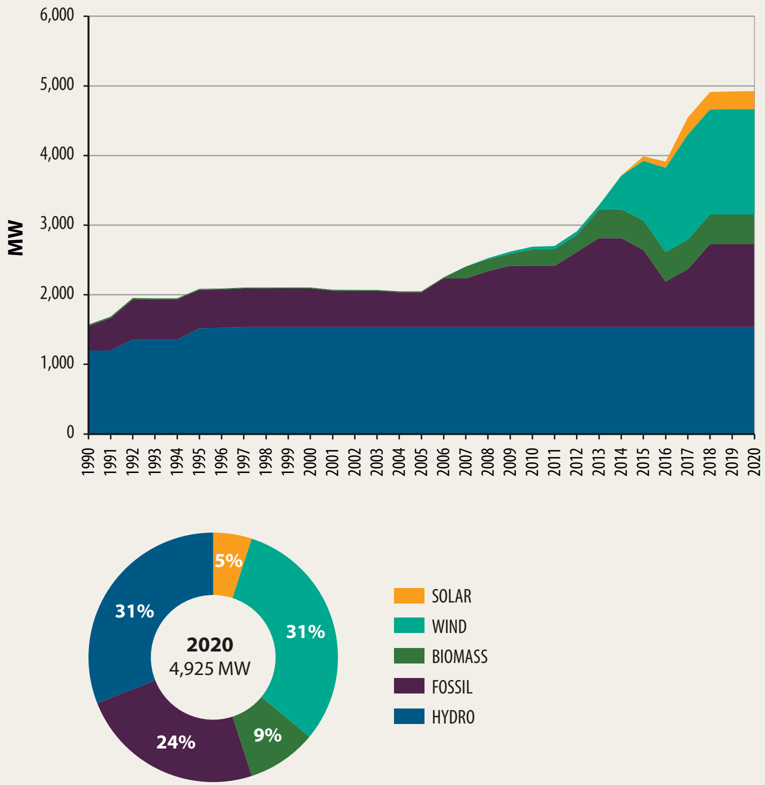
2.1. Power transformation sector

Uruguay has four hydroelectric power plants; three are located on the Río Negro and one on the Río Uruguay (shared with Argentina). Thermal power plants are operated with steam turbines, gas turbines, and engines run on fossil fuels and private generators that use biomass. In addition, the power transformation sector includes public, private, and mixed-capital wind and solar generators. The National Interconnected System (SIN) has interconnections with Argentina (2,000 MW) and Brazil (570 MW).

By the end of 2020, Uruguay had a total installed capacity of 4,925 MW, including the generators connected to the SIN and the isolated autoproduction generators. This capacity included 1,538 MW from hydropower, 1,514 MW from wind, 1,190 MW from thermal power (fossil fuels), 425 MW from thermal biomass, and 258 MW from photovoltaic solar generators. Considering installed capacity by source, 76% corresponded to renewable energy (hydropower, biomass, wind, and solar), while the remaining 24% was nonrenewable energy (gas oil, fuel oil, and natural gas).

2020:
4,925 MW of installed generating capacity, 76% of which comes from renewable sources.

CHART 1. Installed capacity by source.



Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

In the early 1990s, the total capacity of the generation park increased by 33%: from 1,571 MW (1990) to 2,085 MW (1995). This was mainly due to added capacity from fossil and hydropower sources (Uruguay began to use 50% of Salto Grande's installed capacity). Afterwards, almost no new generators were included until 2005, when the total installed capacity had a net growth of 140%, reaching 4,925 MW towards the end of 2020. This growth was influenced by new local energy sources—which complemented traditional sources—and the diversification of the energy matrix over the last few years. Although the increase was net in the entire period, 2016 was the only year when the total installed capacity declined compared to the previous year, as fewer thermal plants operated, as detailed below. In 2017, installed capacity grew again, reporting a new historical maximum in 2019 caused by the combined cycle plant's operational startup in Punta del Tigre (2018) and a series of wind farms and photovoltaic plants in the last three years. In 2020, installed capacity grew (from 4,920 MW to 4,925 MW) after introducing 5 MW in photovoltaic solar energy.

TABLE 1. Installed capacity by source.

MW	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Fossil															
Steam turbines	256.5	256.5	256.5	255.0	255.0	255.0	255.0	255.0	255.0	205.0					
Gas turbines	54.7	249.7	249.7	235.7	535.7	535.7	635.7	835.7	835.7	815.7	565.7	745.7	1,105.7	1,105.7	**1,105.7**
Engines	38.8	44.4	46.0	5.5	85.0	85.0	185.0	184.2	184.2	84.2	84.2	84.2	84.2	84.2	**84.2**
Total Fossil	**350.0**	**550.6**	**552.2**	**496.2**	**875.7**	**875.7**	**1,075.7**	**1,274.9**	**1,274.9**	**1,104.9**	**649.9**	**829.9**	**1,189.9**	**1,189.9**	**1,189.9**
(%)	**22%**	**26%**	**26%**	**24%**	**33%**	**32%**	**37%**	**39%**	**34%**	**28%**	**17%**	**18%**	**24%**	**24%**	**24%**
Biomass															
Steam turbines	21.6	14.9	13.7	13.5	234.6	242.1	243.0	413.0	413.0	423.0	423.0	423.0	423.0	423.0	**423.0**
Engines				1.0	1.0	1.0	1.0	1.0	1.6	1.6	1.6	1.6	1.6	1.7	**1.7**
Total Biomass	**21.6**	**14.9**	**13.7**	**14.5**	**235.6**	**243.1**	**244.0**	**414.0**	**414.6**	**424.6**	**424.6**	**424.6**	**424.6**	**424.7**	**424.7**
(%)	**1%**	**1%**	**1%**	**1%**	**9%**	**9%**	**8%**	**13%**	**11%**	**11%**	**11%**	**9%**	**9%**	**9%**	**9%**
Hydro															
Total Hydro	**1,199.0**	**1,519.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**	**1,538.0**
(%)	**76%**	**73%**	**73%**	**75%**	**57%**	**57%**	**53%**	**47%**	**41%**	**39%**	**39%**	**34%**	**31%**	**31%**	**31%**
Wind															
Total Wind					**40.6**	**43.6**	**52.6**	**59.4**	**481.3**	**856.8**	**1,211.5**	**1,510.7**	**1,510.7**	**1,513.9**	**1,513.9**
(%)					**2%**	**2%**	**2%**	**2%**	**13%**	**21%**	**31%**	**33%**	**31%**	**31%**	**31%**
Solar															
Total Solar					**0.1**	**0.4**	**0.6**	**1.6**	**3.7**	**64.5**	**88.9**	**242.6**	**248.4**	**253.8**	**258.3**
(%)					**0%**	**0%**	**0%**	**0%**	**0%**	**2%**	**2%**	**5%**	**5%**	**5%**	**5%**
TOTAL	**1,570.6**	**2,084.5**	**2,104.0**	**2,048.6**	**2,690.0**	**2,700.8**	**2,911.0**	**3,287.9**	**3,712.5**	**3,988.7**	**3,912.9**	**4,545.7**	**4,911.5**	**4,920.2**	**4,924.7**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

The evolution of the installed capacity in **hydroelectric power plants** increased until the beginning of the 1990-2020 period, given the gradual addition of power from the Salto Grande hydropower plant into Uruguay: 50% of 1,890 MW from 1995. Since that year, Uruguay completed its installed capacity in large-scale hydropower, which remains constant. The share of hydropower plants in the total capacity went from 76% (in 1990) to 31% (in 2020).

The installed capacity of **thermal generators that run on fossil fuel**, the installed capacity went from 350 MW (in 1990) to 551 MW (in 1995). This was mainly due to the installation of La Tablada thermal power plant. Since that year, the installed capacity has remained relatively constant, increasing significantly later on, between 2005 and 2014, when 600 MW corresponding to turbines and 179 MW corresponding to engines were incorporated (100 MW of which was rented). In 2013-2014, the maximum value of installed capacity from fossil fuels was reported. Then the trend changed, and the value decreased in the following two years. Between 2014 and 2015, the capacity of thermal fossil generators decreased 170 MW because Sala B at Central Batlle, the turbine in Maldonado, and the engines rented since 2012 ceased to operate. Between 2015 and 2016, there was a 405 MW reduction because the 5th and 6th units of Central Batlle and the leased equipment APR A and APR B ceased to operate. Between 2017 and 2018, the three combined cycle turbines started running in Punta del Tigre B (540 MW). This increased installed capacity from fossil fuels—which remained the same in 2020—and resulted in a 24% share compared to the total installed capacity for the previous year. This new plant in Punta del Tigre is rarely used. Still, it is essential to provide the system with the necessary security and reliability to meet domestic demand and as a source of energy that can be exported to neighboring countries and is considered the thermal backup for the next 30 years.[2]

2- https://portal.ute.com.uy/noticias/ciclo-combinado-respaldo-menor-costo

CHART 2.a. Installed capacity of each source / Hydro.

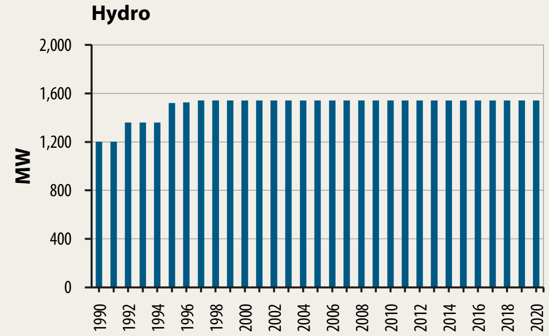
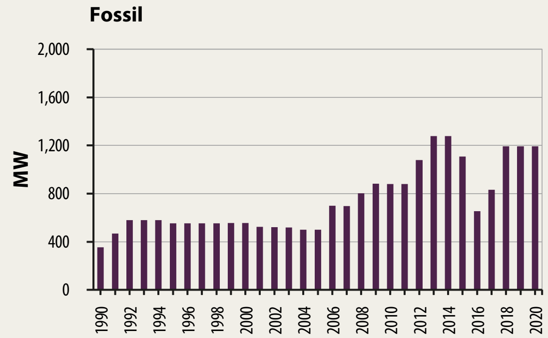


CHART 2.b. Installed capacity of each source / Fossil.



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Historically, the installed capacity of **thermal generators using biomass** did not exceed 22 MW until a significant growth began in 2006. The electricity purchase contracts between UTE and private generators started to enter into force in 2007. As a result, there was a 410 MW growth in the installed capacity from biomass over the last thirteen years. In particular, the increases recorded in 2007 and 2013 corresponded to the installation of cellulose plants. Biomass share amounted to 1% of the total generation capacity until 2006, reaching a maximum value of 13% in 2013 and 9% in 2020.

In turn, large-scale **wind energy** became part of the mix of energy generation in 2008, with the startup of the first wind farms in the country. Both private and public wind generators have been included since that year. This energy source has developed significantly, mainly between 2014 and 2017. Until 2013, 59 MW of wind generators was installed, and as of 2014, between 300 and 400 MW came into operation each year. In this way, in December 2017, there were 43 largescale wind farms connected to the network. Their total installed capacity was 1,511 MW considered jointly with microgenerators and autonomous plants. In 2018, there were no new installations, and in 2019, 2.2 MW were installed. This corresponded to off-grid autoproducers (not connected to the SIN), and a single park expanded its power by 1 MW. The share of wind generators in 2020 was 31% of the total installed capacity. 2019's installed capacity stayed the same as there were no new installations.

CHART 2.c. Installed capacity of each source / Biomass.

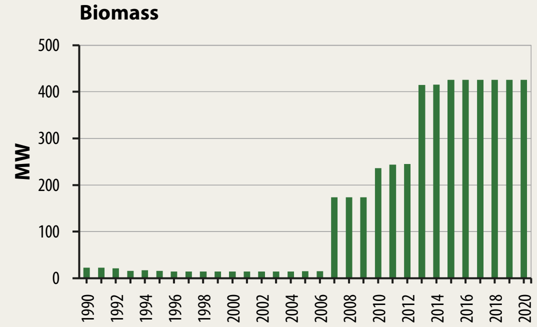
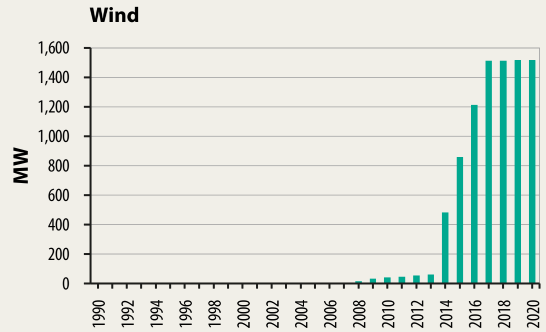


CHART 2.d. Installed capacity of each source / Wind.



As of December 2020,
there are over 40 large-scale wind farms.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Finally, we must mention **photovoltaic solar energy**. Although it has been used as a source in the country for many years, it still reports small values compared to other energy sources. Another highlight is the increased installed capacity recorded from 2015, from 4 MW (2014) to 258 MW (2020). In 2017 and 2018, 13 photovoltaic plants started operating for a total of 150 MW, which meant that solar energy had a 5% share in the total installed capacity in Uruguay.

Smallscale photovoltaic generation has also developed significantly in recent years, with 154 new facilities connected to the network and a total installed capacity of 3.6 MW for 2020. This was the sectorspecific distribution in order of importance: commercial/services (58%), industrial (20%), agriculture (15%), residential (7%).

CHART 2.e. Installed capacity of each source / Solar.

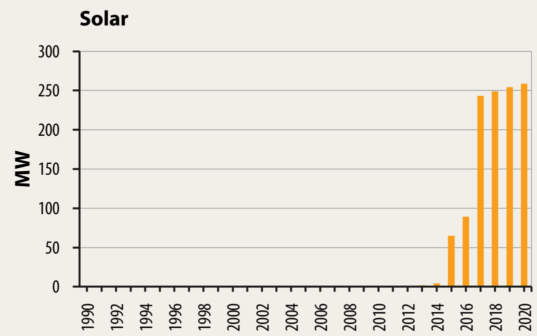


CHART 3. Installed capacity of solar microgeneration by sector.

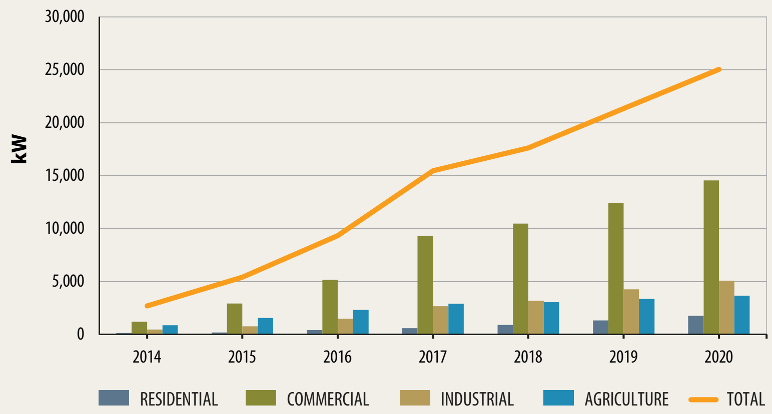


TABLE 2. Installed capacity of solar microgeneration.

kW	2014	2015	2016	2017	2018	2019	2020
Residential	133	179	413	576	895	1,319	**1,764**
(%)	5%	3%	4%	4%	5%	6%	**7%**
Commercial	1,206	2,914	5,137	9,312	10,481	12,412	**14,542**
(%)	45%	54%	55%	60%	60%	58%	**58%**
Industrial	473	756	1,469	2,667	3,181	4,271	**5,066**
(%)	18%	14%	16%	17%	18%	20%	**20%**
Agriculture	875	1,558	2,313	2,895	3,053	3,343	**3,656**
(%)	33%	29%	25%	19%	17%	16%	**15%**
TOTAL	**2,687**	**5,408**	**9,331**	**15,450**	**17,610**	**21,344**	**25,028**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Ministerio de Industria, Energía y Minería

BEN
BALANCE ENERGÉTICO NACIONAL URUGUAY

2.2. Hydrocarbon sector[3]

Regarding the hydrocarbon sector, Uruguay has only one refinery that belongs to ANCAP, the state oil company located in Montevideo. It has a refining capacity of 50,000 barrels per day (8,000 m^3/day) and, among other products, it produces mainly gas oil, gasoline, fuel oil, LPG (LP gas and propane), and jet fuels. Crude oil enters the country through Terminal Petrolera del Este, in José Ignacio, Maldonado. It enters through a buoy located 3,600 meters off the coast; it is transported to Montevideo's refinery through a 180 km oil pipeline. Fuels and other oil products are transported nationwide by road and sea, using the distribution plants in Montevideo, Canelones, Colonia, Durazno, Paysandú, and Treinta y Tres[4].

The refinery
has a refining capacity of 50,000 bbl/d.

The refinery started operating in 1937, and its equipment and oil-processing capacity have evolved over the years. The highlight of this evolution was the 1993-1995 remodeling; there was no production throughout 1994. At that time, a new catalytic cracking unit and a new visbreaking unit were installed. Additionally, changes were made around the plant to increase the energy efficiency of atmospheric distillation and vacuum units. This remodeling increased the refinery's processing capacity to 37,000 barrels/day (5,900 m^3/day).

In 1999, another significant remodeling period began, aiming to produce high-octane unleaded fuels. A gasoline hydrotreating unit, an isomerization unit, and a continuous catalytic reforming unit were thus installed, expanding the crude-processing capacity to 50,000 barrels a day. Between September 2002 and March 2003 and between September 2011 and January 2012, the refinery was shut down for scheduled maintenance.

The desulfurization plant was in full operation for an entire year in 2014 for the first time, producing gas oil and gasoline with low sulfur content, in line with international fuel specifications. The plant can produce 2,800 m^3/day of gas oil 50S and 800 m^3/day of gasoline 30S, with a maximum concentration of 50 and 30 ppm of sulfur, respectively. Finally, the sulfur recovery plant has an installed capacity of 30 tonnes/day; it provides the liquid sulfur sold in the domestic market as raw material for fertilizers.

The refinery was shut down between February and September 2017 for unit maintenance activities. As a result, there was a decrease in crude oil imports and an increase in the import of oil products to meet demand. In 2018, the refinery had normal operations, with a crude oil processing level similar to 2016 (2% higher).

3- Data taken from https://www.ancap.com.uy/ and from https://www.gcds.com.uy/
4- https://www.ancap.com.uy/1738/1/infraestructura.html

Search
Print

CHART 4. Refinery production structure.

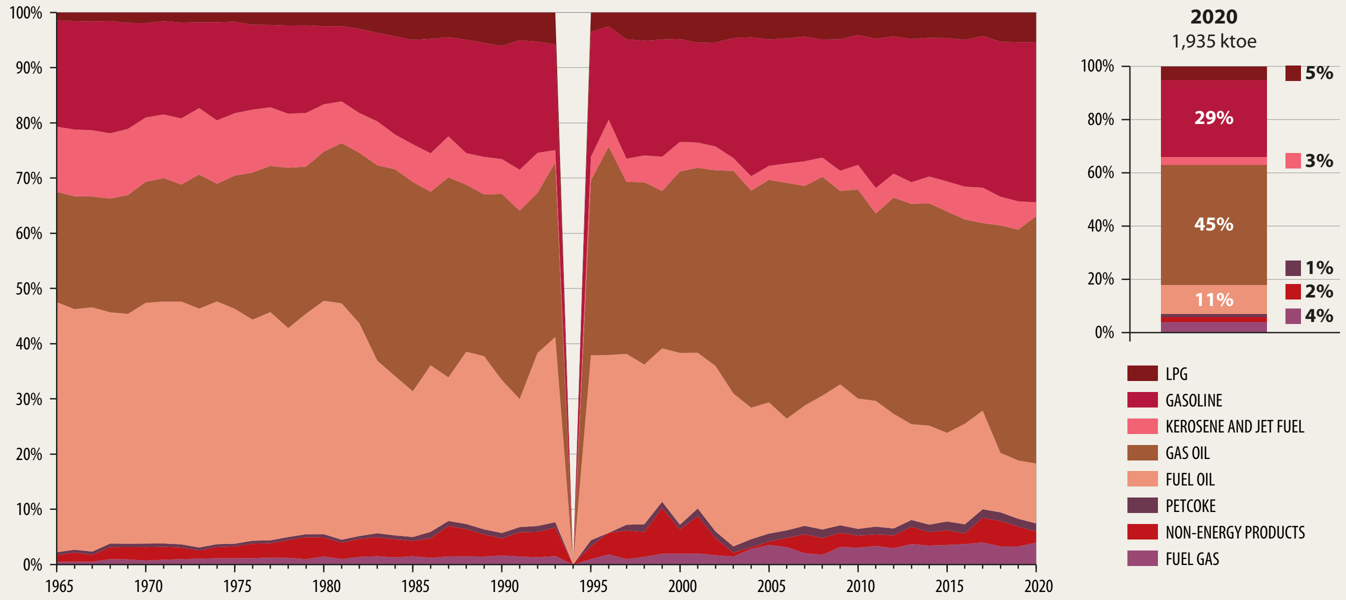


TABLE 3. Refinery production.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Liquefied petroleum gas	21.1	44.4	46.8	99.4	77.1	62.2	82.9	99.4	87.6	87.6	104.8	24.3	115.7	111.5	**104.9**
(%)	1%	2%	4%	5%	4%	5%	4%	5%	5%	5%	5%	4%	5%	5%	**5%**
Gasoline	290.7	254.8	301.9	469.6	447.3	352.7	478.4	538.3	483.1	492.9	562.6	157.8	614.9	599.9	**560.7**
(%)	19%	14%	23%	23%	24%	27%	25%	26%	25%	26%	26%	28%	28%	29%	**29%**
Kerosene and jet fuel	177.9	154.5	57.0	51.9	85.0	60.3	83.8	81.3	93.3	103.4	125.8	36.9	113.8	107.0	**48.9**
(%)	12%	9%	4%	3%	4%	5%	4%	4%	5%	5%	6%	6%	5%	5%	**3%**
Gas oil	301.2	485.9	422.7	825.9	719.2	442.9	753.6	828.0	773.7	760.7	783.0	195.1	901.9	869.6	**866.7**
(%)	20%	27%	32%	40%	38%	34%	39%	40%	40%	40%	37%	34%	41%	42%	**45%**
Fuel oil	683.2	760.9	446.8	486.8	448.7	297.2	399.4	360.0	344.5	304.6	385.3	102.5	236.0	219.8	**209.9**
(%)	45%	42%	33%	24%	24%	23%	21%	17%	18%	16%	18%	18%	11%	11%	**11%**
Petcoke	7.5	10.8	14.1	29.7	22.8	18.6	23.9	26.0	25.9	29.9	35.2	9.0	34.3	29.3	**28.1**
(%)	0%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	1%	**1%**
Non-energy products	18.6	62.2	31.5	12.6	41.9	27.1	44.6	64.7	47.0	50.8	40.9	25.5	101.1	74.9	**39.2**
(%)	1%	3%	2%	1%	2%	2%	2%	3%	2%	3%	2%	4%	5%	4%	**2%**
Fuel gas	7.3	26.0	13.0	72.6	58.1	43.9	57.2	76.7	66.0	67.3	78.1	23.0	71.7	68.1	**76.9**
(%)	0%	1%	1%	4%	3%	3%	3%	4%	3%	4%	4%	4%	3%	3%	**4%**
TOTAL	**1,507.5**	**1,799.5**	**1,333.8**	**2,048.5**	**1,900.1**	**1,304.9**	**1,923.8**	**2,074.4**	**1,921.1**	**1,897.2**	**2,115.7**	**574.1**	**2,189.4**	**2,080.1**	**1,935.3**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTES: 1) La Teja refinery has a daily refining capacity of 50,00Gas oil includes diesel oil until 2012. Diesel oil has not been produced since 2013. **3)** The refinery was shut down because of scheduled maintenance of its units during the following periods: a- from September 2011 to January 2012; b- between February and September 2017.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Finally, Argentina supplies natural gas through two gas pipelines with a total capacity of 6,000,000 m³/day. The coastal gas pipeline operated by ANCAP is located in the northwest of the country. It opened in October 1998, and its laying begins in Entre Ríos (Argentina) and ends in the city of Paysandú. The pipeline has 27,200 meters (including distribution branches in Uruguay and the section over the international bridge) and supplies the local distribution network[5].

There are two gas pipelines with a total capacity of 6,000,000 m³/day.

Furthermore, the second pipeline has been in operation since November 2002 in the southwestern part of the country and is operated by Gasoducto Cruz del Sur (GCDS). The system stretches from Punta Lara (Argentina) to Montevideo and its surroundings, going through the departments of Colonia, San José, and Canelones. It has two trunk pipelines: an underwater trunk for the Río de la Plata crossing (57 km approx.) and a land trunk (145 km approx.) between Colonia and Montevideo, as well as several side pipelines that feed many towns (200 km approx.).

5- https://www.gub.uy/ministerio-industria-energia-mineria/comunicacion/publicaciones/mapas-energeticos

2.3. Biofuel sector[6]

As of 2010, the BEN has included the production and consumption of biofuels, mainly used in the transport sector blended with gasoline and gas oil. Law 18,195 (14/Nov/2007) and its Regulatory Decree 523/008 (27/Oct/2008) established the legal framework for producing, marketing, and using agrofuels in Uruguay.

We have entered two new markets in recent years: the Chilean market for the export of bioethanol and the Dutch market for the export of biodiesel produced from recycling frying oil.

Regarding **bioethanol production**, ALUR currently has two production plants in the north of Uruguay. In 2006, ALUR began to manage the sugar factory belonging to cooperative CALNU in Bella Unión (Artigas), starting from an energy and food project that involved an industrial investment plan to set up a distillery to produce ethanol, among other actions. This agroenergyfood complex produces bioethanol, sugar, electricity, and animal feed, mainly from sugar cane juice and molasses and sweet sorghum juice to a lesser extent. The plant's capacity is 120 m³/day for bioethanol, operating from May to October. It has worked at higher than nominal capacity (140-190 m³/day) on many occasions.

In October 2014, a new ethanol production plant was opened in Paysandú, with a 70,000 m³/year installed capacity. The plant can process grain sorghum, maize, wheat, and barley, operating nonstop throughout the year to produce bioethanol and animal feed. Katzen, a United States company, developed the selected technology. It stands out as it is energy-efficient, offers the possibility to use summer and winter crops, and has a low environmental impact.

6- Data taken from http://www.alur.com.uy/ (June 2021), as well as from direct contact with the company.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Regarding **biodiesel production**, ALUR features two industrial complexes located in Montevideo. 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 oil for frying, and beef fat. In addition, glycerin is produced as a byproduct, but this plant is not currently in operation. Plant N°2—which is in operation—is located in Capurro and has a biodiesel installed capacity of 62,000 m^3/year from vegetable oil, used frying oil, and beef fat. The products are biofuel, olein, and glycerin.

Installed production capacity (operational):
bioethanol: 92,200 m^3/year
biodiesel: 50,000 tonnes/year

An agreement was signed with the company COUSA to ensure the efficient production of biodiesel, whereby its infrastructure is available for use. In turn, the private company provides grain milling and oil production services, supplying the raw material for both biodiesel plants. Soybeans and canola seeds are received to produce crude degummed oil and protein meal.

In 2015, the industrial process of plants N°1 and N°2 and the final product were certified according to the European standard *International Sustainability and Carbon Certification* (ISCC) to produce biodiesel from frying oil and fat.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

3. Energy supply

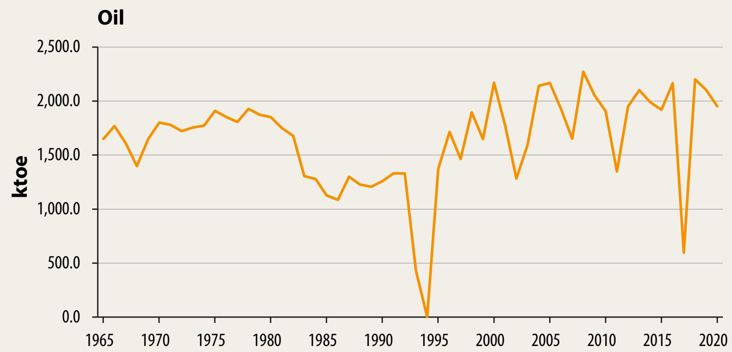
The total gross energy supply in the country in 2020 was 5,283 ktoe, which was 7% lower than the 2019 figure. This sharp drop is partly explained by the significant contraction of the economy (5.9% GDP drop) and the low rainfall levels in 2020. The primary sources included in the energy supply in 2020 were:

Oil and oil products:

In 2020, the gross oil supply was 1,951 ktoe, decreasing 7% compared to 2019. The load of the refinery was similar to the gross supply (1,947 ktoe). In 2020, 1,995 ktoe of oil were imported (2,389 thousand m^3)—2% less than the previous year.

In 2020, the gross supply of oil products amounted to 2,076 ktoe: almost the same figure as 2019. A production level of 1,935 ktoe and imports of 324 ktoe were recorded within supply activities. This implies a 7% drop in production compared to 2019 and a 94% increase in imports. This was caused by reduced final demand for oil products, partly due to COVID-19-related actions (mobility reduction), which impacted the refinery's production. However, gas oil consumption, mainly for electricity generation, grew by 368%, which explains 40% of the total oil product imports. Gas oil consumption for energy generation is a consequence of the low rainfall levels in 2020 and the export of electricity of thermal origin. The main products imported in 2020 were gas oil, petcoke, and, to a lesser extent, non-energy products, and LPG. In 2020, fuel oil was 100% supplied by the refinery, and there were no direct imports from free trade zones.

CHART 5.a. Energy supply by source / Oil.



Meanwhile, the export of oil products in 2020 was 7 ktoe, almost the same as in 2019, and corresponded to gasoline, propane, and non-energy products. The flow in the international bunker dropped 44% in the last year due to a 56% reduction in jet fuels: from 100 ktoe to 44 ktoe. Fuel oil consumption also decreased significantly, falling by 79% and from 67 ktoe to 14 ktoe. Gas oil did not vary significantly, recording a 5% reduction.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Natural gas:

Natural gas imports amounted to 60 ktoe in 2020: 26% less than 2019. It is important to note that the outlier is the 2019 value, as the 2020 value is in line with recent years. The high 2019 value is explained by the consumption recorded in the electricity sector, specifically in the tests conducted by UTE in the new combined cycle power plant, which accounts for 26 ktoe of the 80 ktoe imported in 2019.

Hydropower:

Hydropower gross supply varies considerably, as it depends on the hydrological characteristics of each year. In 2020 it dropped 63% compared to 2019. The 2020 value was 400 ktoe, one of the lowest recorded values in the last 30 years, surpassed only by the 2006 value: 343 ktoe. Discharged water (not used or not flowing through a turbine) is also a variable studied. It amounts to 1% of the hydropower produced, which is practically negligible compared to 2019, when 29% of the water was discharged according to the hydropower produced.

Wind and solar energy:

In 2020, the gross supply of wind energy grew 8%, while solar energy grew 6%. Both sources have continued their upward trend since entering the country in the recent past. There was no increase in the installed capacity of wind power for electricity generation in the last year, while photovoltaic solar energy grew 5 MW (2%).
As for solar energy, solar thermal and photovoltaic energy have been included in the matrix of results since 2014.

CHART 5.b. Energy supply by source / Natural gas.

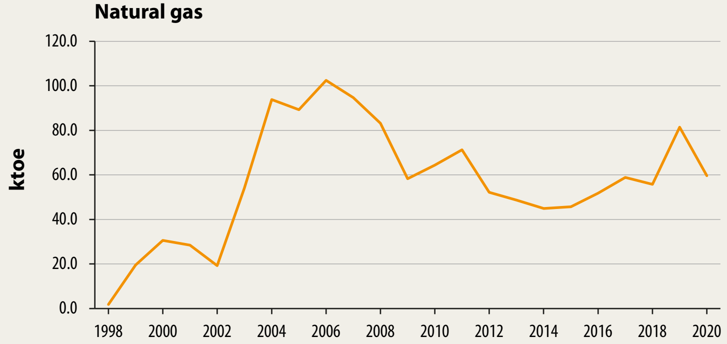


CHART 5.c. Energy supply by source / Hydropower.

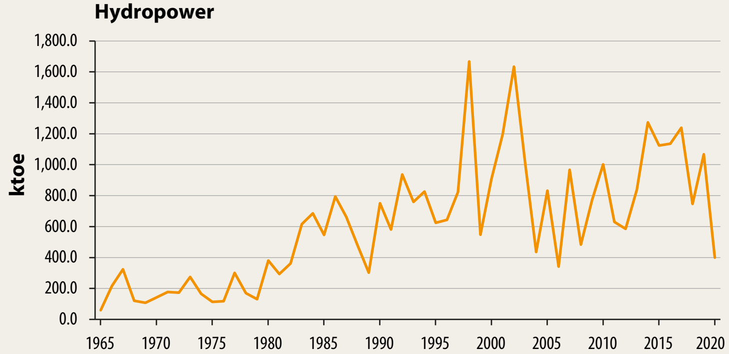
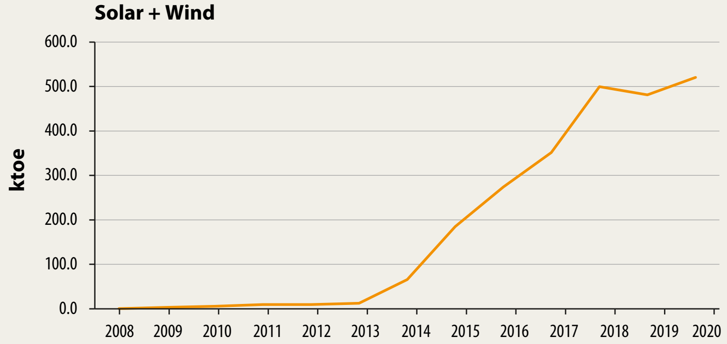


CHART 5.d. Energy supply by source / Solar + Wind.



Ministerio de Industria, Energía y Minería

BEN
BALANCE ENERGÉTICO NACIONAL URUGUAY

Biomass:

The gross biomass supply grew by 3% compared to 2019, reaching a new record consumption of 2,247 ktoe. The gross biomass supply in 2020 accounted for 43% of the gross supply from primary sources, surpassing oil and its 38% share. The various sources must be disaggregated to analyze biomass behavior: firewood, biomass waste (rice husk, sugar cane bagasse, black liquor, odorous gases, methanol, barley husk, and waste from the timber industry), and biomass for biofuel production.

The gross firewood supply for 2020 was 474 ktoe, 6% lower than the 2019 records (503 ktoe), thus maintaining the figures for the last few years.

The gross supply of biomass waste increased 6% in 2020 (1,663 ktoe) compared to 2019 (1,571 ktoe). The gross supply of biomass for biofuel production in 2020 was 110 ktoe, slightly lower than in 2019 (115 ktoe).

Industrial waste:

As indicated above, including this primary source is one of the improvements of this balance. Its series is reconstructed from 2011, and although its consumption remains low, in 2020, it reached a gross supply of 9.3 ktoe: an 8% growth compared to 2019. This source includes waste such as end-of-life tires, used oils, glycerin, and alternative liquid fuels, formed mainly by hydrocarbons recovered from bilge water and biodiesel industry waste. This new source is classified as nonrenewable.

Coal and coke of coal:

In 2020, gross supply of these sources amounted to 3.8 ktoe, similar to the 2019 figure (3.1 ktoe).

CHART 5.e. Energy supply by source / Biomass waste.

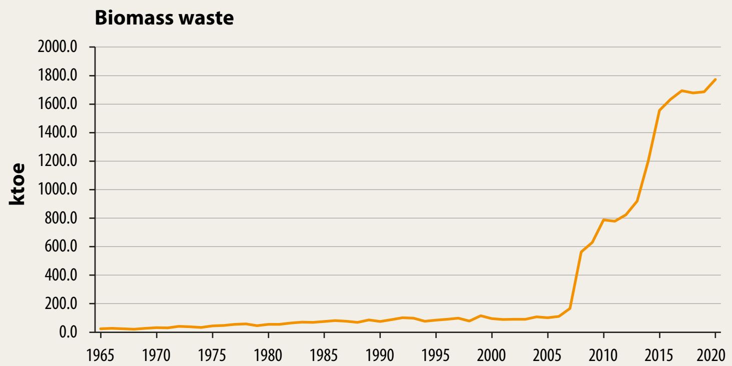
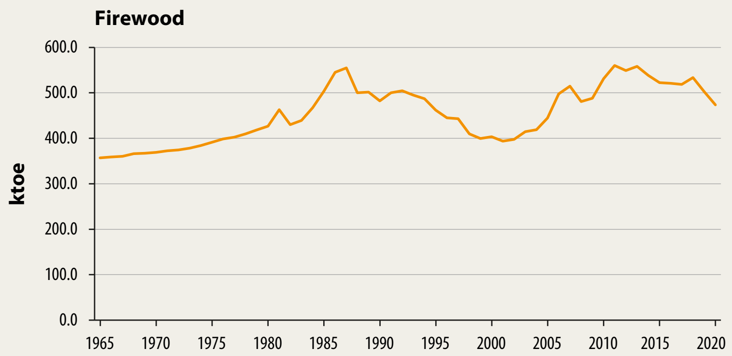


CHART 5.f. Energy supply by source / Firewood.



Imported/exported electricity:

In 2020, imports of 44 ktoe (514 GWh) were recorded. The most recent similar value goes back to 2012; we have relevant import data again after eight years.

In 2020, electricity exports fell 62% compared to 2019. However, to avoid drawing the wrong conclusions, we must remember that 2019 set a new historical maximum export of electricity since 1965 (259 ktoe).

Electricity:
in 2020, electricity imports amounted to 514 GWh, a relevant value after eight years of marginal imports.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

3.1. Energy supply

Uruguay's primary energy matrix, also called "matrix of energy supply," has had a net growth of 137% between 1990 and 2020; it registered a record value in 2018 (5,405 ktoe). In 2020 it was virtually the same as in 2018, decreasing 0.06% (5,402 ktoe). However, it grew 0.13% compared to 2019.

3.1.1. Primary matrix by source

In 2020 and for the fifth consecutive year, biomass took first place in the primary matrix (42%) after it displaced oil and oil products in 2016, which have historically been the primary supply source in the country. For the last year, energy supply was as follows, in order of importance: biomass (42%), oil and oil products (40%), wind electricity (9%), hydroelectricity (6%), and to a lesser extent, natural gas (1%) and solar energy (1%). Solar energy supply includes solar thermal energy and electricity from photovoltaic solar energy. Uruguay's primary matrix also shows that biomass has displaced hydropower from the second position to the third since 2008. In 2020, hydropower held the fourth position as the third place is occupied by wind power.

Over the last few years, there have been significant changes in the primary matrix, mainly due to diversification and a higher share of renewable energy sources. Biomass is one of the sources that has changed the most, not only in share but also in absolute magnitude. This category includes the production of firewood, biomass waste, biomass for biofuels, and charcoal net imports.

Between 1990 and 2007, biomass had a relatively constant share; however, in 2007, it started to have a more critical role, strengthening its position as the second source of importance in Uruguay's energy supply. This significant growth slowed down between 2010 and 2011 and recovered as of 2012, going from 1,373 ktoe (2012) to 2,214 ktoe (2017), thus achieving its highest share in the primary matrix (43%). Between 2017 and 2019, biomass remained practically constant in absolute values, with a slight 0.2% reduction in 2019. It grows again in 2020 (2%), reaching a new record consumption of 2,247 ktoe.

The supply of oil and oil products includes the imports of crude oil to produce oil products in the refinery and the net balance of foreign trade of oil products. This category's share in the primary matrix has varied, mainly according to the demand for oil products for electricity generation. In 1965, practically the entire primary matrix was formed by oil and oil products (79%). Interestingly, although the share fell to 40% (2020), supply has remained relatively constant in absolute terms over these 56 years, at an average of 1,900 ktoe. The last six years recorded the lowest share levels for oil and oil products in the primary matrix; the historical minimum was recorded in 2019. This changed in 2020, which marked a new growth (11%) associated with the consumption of oil products for electricity generation. As indicated in this report, 2020 had one of the lowest rainfall values in the last 30 years. Therefore, electricity generation was partially complemented with fossil fuels, which resulted in an absolute growth in the supply of oil and oil products. However, the final consumption of oil products decreased due to the mobility reduction during the pandemic.

As indicated in the previous paragraph, oil and oil products have remained practically constant in absolute values since 1965, but the supply matrix grew by 142%. The new sources explain this growth. For example, biomass accounts for 42% of the 2020 supply matrix, wind plus solar energy accounts for 10%, and hydropower accounts for 6%. Therefore, the growth recorded in the primary matrix since 1965 has been mainly due to the new energy sources.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Additionally, Uruguay's hydropower supply varies significantly from one year to another, as it relies on weather conditions. In 2019, hydropower accounted for 13% of the primary matrix and only 6% in 2020, considering that the 2020 primary matrix grew by only 0.1% compared to 2019.

It is essential to highlight the evolution of wind electricity in the primary matrix. In 2008, the first year the country had largescale wind energy, electricity generation amounted to 0.63 ktoe and increased to 471 ktoe in 2020. The highest increase was recorded between 2014 and 2018, and the share of wind electricity increased from 1% to 8%. Although the figures remain small in the supply matrix, wind power surpassed hydroelectricity in 2020 and reached third place in the supply matrix with a 9% share. Wind energy had a remarkable share in the electricity generation matrix, as will be seen further on. It must be noted that 35 largescale wind farms began operations between 2014 and 2017, reaching 1,514 MW of installed capacity in 2020, considering microgeneration facilities and offgrid autoproducers.

The remaining sources in the matrix of supply in 2020 had a minimal share: natural gas (1%), solar (1%), and coal and coke (<1%). We must mention industrial waste as the new source in this energy balance, which reached 9.3 ktoe.

Start
Table of Contents
Go back

Search
Print

CHART 6. Energy supply by source.

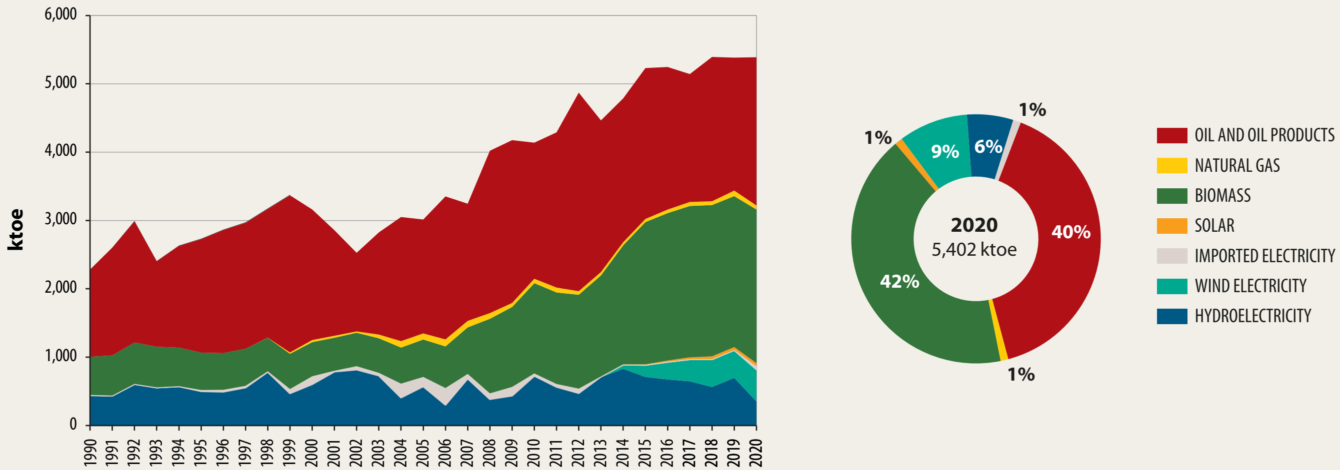


TABLE 4. Energy supply by source (primary matrix).

ktoe	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Imported electricity	4.4	16.2	114.2	136.3	33.3	41.0	63.8			0.2	2.1	0.3	1.2	0.0	**44.2**
(%)	0%	1%	4%	5%	1%	1%	1%			0%	0%	0%	0%	0%	**1%**
Hydroelectricity	443.1	503.5	606.4	574.8	723.0	557.2	466.2	705.7	829.8	710.9	674.4	646.5	563.9	697.3	**352.1**
(%)	19%	18%	19%	19%	17%	13%	10%	16%	17%	14%	13%	13%	10%	13%	**6%**
Wind electricity					6.0	9.6	9.7	12.4	63.0	177.6	257.5	324.6	407.0	408.7	**470.9**
(%)					0%	0%	0%	0%	1%	3%	5%	6%	8%	8%	**9%**
Solar									2.9	7.1	16.4	26.8	39.9	41.2	**45.4**
(%)									0%	0%	0%	1%	1%	1%	**1%**
Natural gas			30.6	89.3	64.4	71.5	52.2	48.8	45.0	45.8	51.8	58.5	55.2	80.8	**59.8**
(%)			1%	3%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	**1%**
Oil and oil products	1,275.4	1,661.0	1,910.8	1,666.9	1,991.7	2,270.6	2,905.1	2,218.9	2,105.4	2,207.8	2,086.3	1,871.8	2,111.8	1,945.9	**2,168.8**
(%)	56%	61%	60%	55%	48%	53%	60%	50%	44%	42%	40%	36%	39%	36%	**40%**
Coal and coke	0.7	0.5	0.5	1.9	1.6	1.8	2.1	2.4	1.8	2.4	3.5	3.2	3.2	3.1	**3.8**
(%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Biomass	558.3	546.7	499.2	546.9	1,320.3	1,339.2	1,373.4	1,478.5	1,740.4	2,080.5	2,157.3	2,213.9	2,213.8	2,189.1	**2,247.4**
(%)	24%	20%	16%	18%	32%	31%	28%	33%	36%	40%	41%	43%	41%	41%	**42%**
Industrial waste						2.1	1.6	4.3	3.4	6.0	7.0	6.4	8.7	8.6	**9.3**
(%)						0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
TOTAL	**2,281.9**	**2,727.9**	**3,161.7**	**3,016.1**	**4,140.3**	**4,293.0**	**4,874.1**	**4,471.0**	**4,791.7**	**5,238.3**	**5,256.3**	**5,152.0**	**5,404.7**	**5,374.7**	**5,401.7**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTES: 1) In 2013 and 2014, no electricity was imported. Since 2015, there has been an exchange with Argentina considered "return of energy", except for 2018, when a "contingent" mode was adopted at the corresponding cost. In turn, while electricity has been imported from Brazil since 2016, it has been used to test the new interconnection.**2)** Solar energy supply includes solar thermal energy and photovoltaic solar electricity.

Ministerio de Industria, Energía y Minería

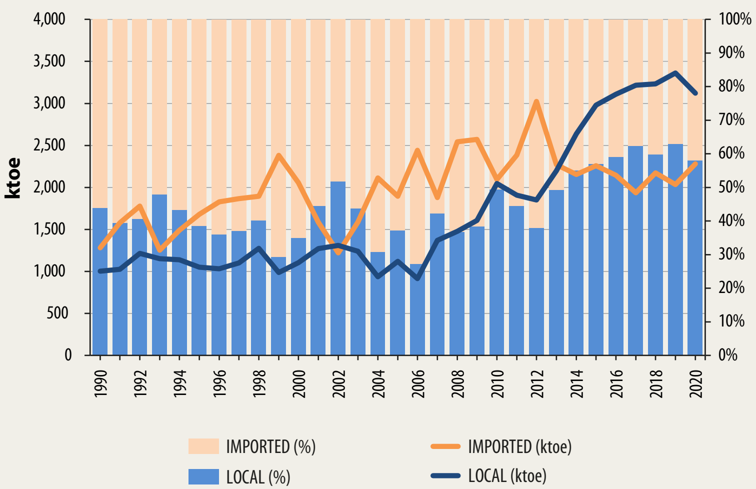
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

3.1.2. Primary matrix by origin

In 2020, the energy supply was 58% from local sources and 42% from imported sources. The last six years of the entire series showed the most significant shares of local energy in the supply: 2019 (63%), 2017 (62%), 2018 (60%), 2016 (59%), 2015 (57%). In absolute terms, it is essential to note the net increase in local origin energy supply over the last few years. In the 1990-2006 period, local origin energy supply remained between 913 ktoe (2006) and 1,309 ktoe (2002). There has been a net growth since 2007, reaching 3,123 ktoe in 2020 (7% less than in 2019). This figure remains within the value range of recent years as it is similar to the 2016 figure.

Imported energy supply has varied throughout the period, reaching a maximum value of 3,025 ktoe (2012) and a minimum value of 1,220 ktoe (2002). In 2020, 12% more energy was imported than in 2019.

CHART 7. Energy supply by origin.



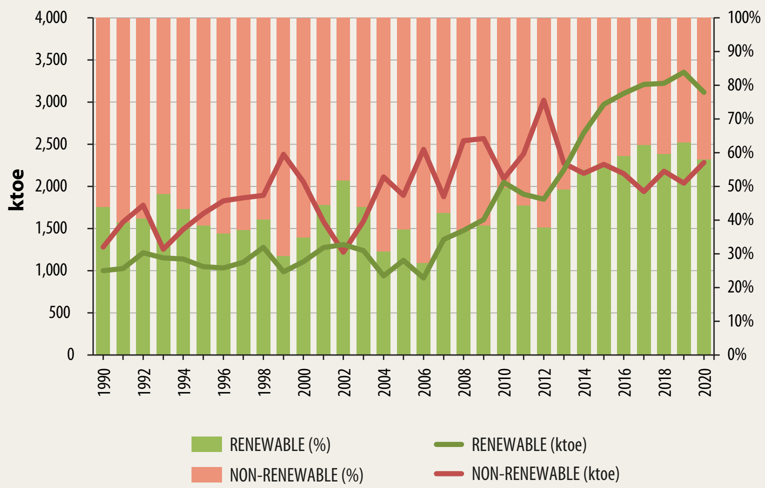
3.1.3. Primary matrix by type

Regarding energy supply, sources are also classified into renewable and nonrenewable. In 2020, renewable energy sources (biomass, solar thermal energy, hydropower, wind power, and photovoltaic solar energy) had a 58% share in the matrix of supply, while 41% corresponded to nonrenewable sources (oil and oil products, natural gas, coal and coke, industrial waste). The remaining 1% corresponded to imported electricity, which remains independent since it cannot be classified as renewable or nonrenewable.

2020 primary matrix: 58% renewable energy

There is a strong correlation between energy origin and energy type. Renewable energy supply comes mainly from local sources, and the country imports energy to cover the supply of nonrenewable sources.

CHART 8. Energy supply by type.



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Renewable energy supply grew significantly towards the end of the 1990-2020 period, increasing almost threefold the average recorded over the 15 years before 2005. In 2019, the maximum historical supply of renewable sources was recorded in absolute terms (3,356 ktoe) and in share (63%). Although this share fell to 58% in 2020, it falls within the values from 2015 onwards, and its share is higher than that recorded in 2015. Until now, this share percentage was strongly influenced by rainfall levels. However, due to Uruguay's efforts to diversify the energy matrix and the major inclusion of local sources, the influence of hydropower variability on the supply matrix has decreased. For example, 2006 rainfall levels are similar to those recorded in 2020. However, renewable sources had a 27% share in the matrix, while in 2020, the share was 58%, as explained above. This shows that diversifying the matrix also strengthens the national energy system.

3.2. Electricity generation

The installed capacity of the electric grid by the end of 2020 was 4,925 MW, practically the same as in 2019 (4,920 MW). The structure remained the same: 31% hydraulic generators, 31% wind generators, 24% thermal power plants (fossil fuels), 9% thermal power plants (biomass), and 5% solar generators. In 2020, 96% of the electricity demand was covered with domestic production. A total of 13,557 GWh of electricity was generated (1,166 ktoe), amounting to a 16% drop compared to the previous year. This generation included 87% from power plants for public service (1,018 ktoe), while 13% was generated in autoproduction power plants (148 ktoe). The variations regarding 2019 were 18% and +2% respectively.

In 2020, 94% of the electricity was generated from renewable sources.

In 2020, Uruguay exported 1,148 GWh (99 ktoe) of electricity, 62% less than the previous year. However, we must remember that 2019 marked the country's highest electricity exports since 1965. Although the drop in exports is significant, the exports recorded in 2020 were surpassed only six times in the 56 years of the energy balance. Regarding export destination, in 2020, 38% of the electricity was exported to Brazil, while the remaining 62% was exported to Argentina. As for Argentina, October 2017 marked the first exports of wind electricity by generating agents other than UTE. They amounted to 1% of the 2019 total exports. Additionally, biomass energy was exported to Brazil in 2020.

Additionally, final electricity consumption (calculated as generation plus imports minus exports, technical losses, and own use) did not change significantly compared to 2019. The final energy consumption supplied from the SIN (excluding the electricity generated by autoproduction power plants) was similar.

Historically, hydropower has been essential in electricity generation in Uruguay. In particular, as of 1979, its share began to increase in the generation matrix with the Salto Grande plant installation on the Río Uruguay. It was not until 1995 that the right to 50% of the power and production was granted as per convention with Argentina.

There is also a complementarity between hydropower availability and the consumption of fossil fuels for generation. Therefore, lower amounts of fossil fuels were used to generate electricity in years with good rainfall, such as 1998, 2001, 2002, 2010, 2014, and 2015. In turn, in years with lower rainfall, such as 1989, 2004, 2006, 2008, and 2012, the country needed more fossil fuels to generate electricity. It is important to remember that 2020 marked one of the lowest values in hydroelectricity generation, similar to the 2006 figure.

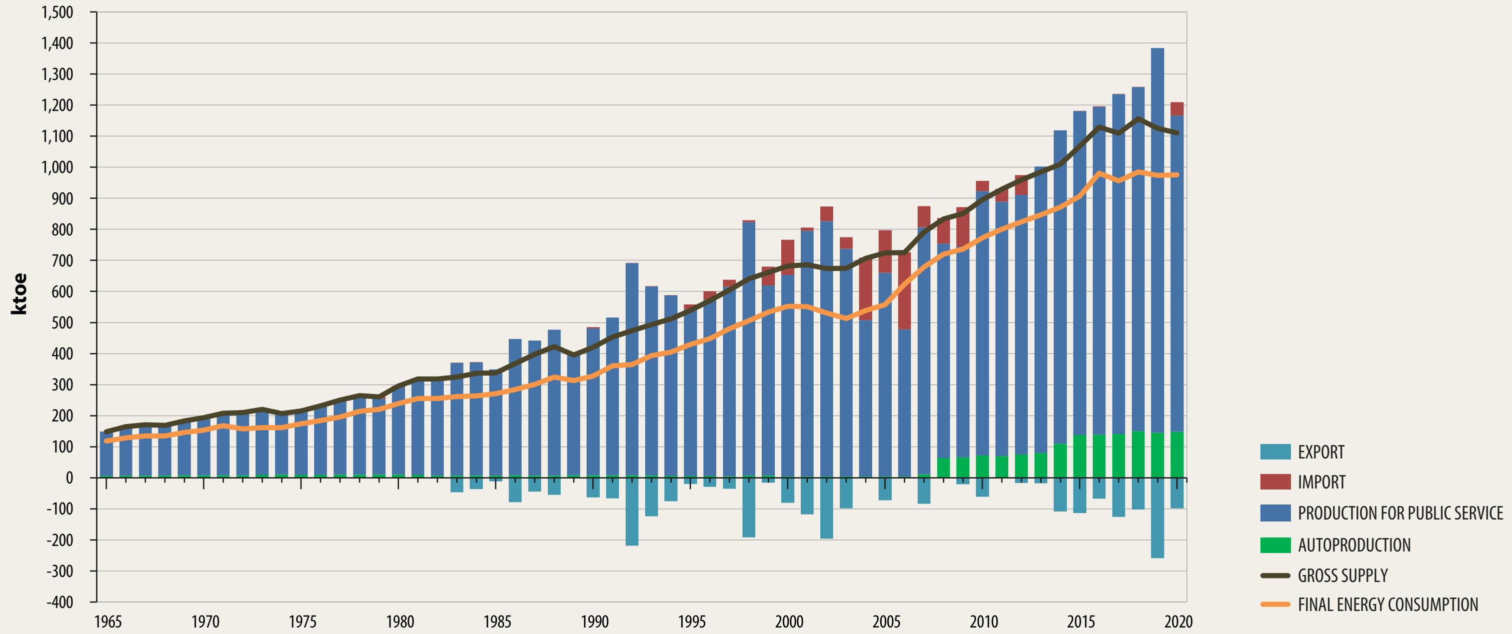
This implied a 162% growth in electricity generation from fossil fuels. The main fossil fuels used were gas oil, whose consumption for generation (145 ktoe) grew 368% compared to 2019. The other fossil fuel used was fuel oil, whose consumption for generation (27 ktoe) increased 173%.

Another characteristic of energy generation is the diversification of sources, which has occurred over the last few years. Therefore, from 1965 to 2000 approximately, the country had three energy sources with a significant stake in the generation matrix: hydropower, fuel oil, and gas oil. However, new energy sources have been used for electricity generation over the last few years, some of which are still marginal but show a growing consumption trend (biomass waste, wind, and solar energy). Although natural gas entered the market in recent years, it remains marginal. In 2020, in particular, this energy source was not used for electricity generation.

Regarding wind energy, it became part of the matrix of generation in 2008 and had a slow increase in the first years of its development. However, there has been a significant increase in electricity generation in the last seven years: from 144 GWh (2013) to 5,476 GWh (2020). In 2016, in particular, wind electricity became the second source in the generation matrix. It continued to increase until it reported a 32% share in the energy matrix in 2018, which amounted to 40% in 2020. This has positioned it as the primary source of electricity generation in 2020, displacing hydroelectricity to second place. Although there was no additional installed capacity from wind generators in 2020, generation from this source grew 15% compared to the previous year.

Biomass became more relevant in 2008 as a raw material for electricity production. This was caused by the fact that the contracts between UTE and private producers connected to the

CHART 9. Electricity.



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

SIN—related to purchasing electricity from biomass—came into force. This included mainly biomass waste for electricity generation in the cellulose pulp industry. Over the last few years, electricity generation with biomass has increased significantly, tripling its value in ten years. Despite this steady growth, in 2016, biomass lost its 2014 second place in the energy matrix, displaced to the third position by wind energy.

Solar energy is an input for electricity generation that has gained momentum despite having a small share over the last few years compared to other sources. Electricity generation from solar energy (462 GWh) grew by 9% compared to 2019, reaching a new generation record since first introduced in the country in 2014. This consolidates solar energy development in Uruguay, which has almost tripled its installed generating capacity in the last three years, reaching 258 MW in 2020.

Wind electricity generation was the primary source of electricity generation in 2020, accounting for 40% of the electricity generation matrix.

Photovoltaic microgeneration connected to the network has increased significantly in recent years: from 2,110 MWh (2014) to 32,021 MWh (2020). There follows the distribution according to sectors in order of importance for the last year: commercial and services (58%), industrial (20%), agriculture (15%) and residential (7%). In turn, the analysis of the relationship between electricity delivered to the grid and electricity for own use in 2020 shows that most of the electricity from photovoltaic microgeneration was delivered to the grid in the agricultural and residential sectors (77% and 72%). In the industrial sector, 56% of the electricity from

TABLE 5. Electricity.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Power plants for public service	141.8	283.2	536.3	657.1	851.7	820.0	836.7	922.7	1,008.6	1,043.0	1,055.6	1,094.4	1,107.3	1,238.9	**1,017.6**
Autoproduction power plants	5.7	9.4	6.0	3.6	71.3	69.6	74.5	79.8	110.1	137.9	138.5	140.9	150.4	144.9	**148.3**
TRANSFORMATION PLANTS	147.5	292.6	542.3	660.7	923.0	889.6	911.2	1,002.5	1,118.7	1,180.9	1,194.1	1,235.3	1,257.7	1,383.8	**1,165.9**
Production	147.5	292.6	542.3	660.7	923.0	889.6	911.2	1,002.5	1,118.7	1,180.9	1,194.1	1,235.3	1,257.7	1,383.8	**1,165.9**
Import	0.1	2.9	16.2	136.3	33.3	41.0	63.8			0.2	2.1	0.3	1.2	0.0	**44.2**
Export	-0.1	-0.0	-20.0	-72.3	-61.1	-1.6	-16.7	-17.8	-108.9	-113.6	-67.0	-125.7	-102.8	-258.9	**-98.7**
International bunker															
Losses	-21.9	-47.3	-100.9	-154.1	-104.2	-110.7	-111.1	-110.2	-107.7	-128.1	-115.2	-123.6	-133.9	-113.7	**-97.1**
Stock change															
Not used															
Adjustments			-0.1	-0.4	-0.1	0.1	0.9	0.6	0.3	-0.1	0.3	-0.1	0.1		**-0.2**
SUPPLY	125.6	248.2	437.5	570.2	790.9	818.4	848.1	875.1	902.4	939.3	1,014.3	986.2	1,022.3	1,011.2	**1,014.1**
GROSS SUPPLY	147.5	295.5	538.4	724.3	895.5	929.1	959.2	985.3	1,010.1	1,067.4	1,129.5	1,109.8	1,156.2	1,124.9	**1,111.2**
TOTAL NET CONSUMPTION	125.6	248.2	437.5	570.2	790.9	818.4	848.1	875.1	902.4	939.3	1,014.3	986.2	1,022.3	1,011.2	**1,014.1**
Own use	7.1	9.2	7.7	13.5	18.2	18.1	24.3	27.9	31.1	33.1	33.8	30.1	37.1	37.5	**38.3**
TOTAL FINAL CONSUMPTION	**118.5**	**239.0**	**429.8**	**556.7**	**772.7**	**800.3**	**823.8**	**847.2**	**871.3**	**906.2**	**980.5**	**956.1**	**985.2**	**973.7**	**975.8**

NOTE: “Losses” include technical and non-technical losses until and including 2005. Starting in 2006, non-technical losses are considered as final energy consumption. Social losses are included in the residential sector and the rest are distributed proportionally according to electricity consumption.

photovoltaic microgeneration was for own use, while in the commercial/services sector, it was more evenly distributed. However, in 2020, the amount delivered to the grid exceeded the amount for own consumption: 54% was delivered to the matrix.

Electricity generation can be analyzed with two approaches: the inputs for generation and the electricity generated by the source. It is essential to point out that the electricity generation matrix has a different structure than the matrix of inputs for generation since it considers transformation efficiency for the various sources. In 2020, a global transformation efficiency of 83% was recorded, with an efficiency loss of 6 points compared to 2019. It remains one of the four highest values in the last decade. If we compare electricity generation in 2020, which had low rainfall levels, with a year of similar rainfall levels, such as 2012, we see that the overall transformation efficiency for 2020 was 56%. This is the best performance of the generation sector in unfavorable environmental situations, such as hydrologic conditions. This is the result of including renewable sources such as wind energy, which, as already indicated, was the main source of generation in 2020.

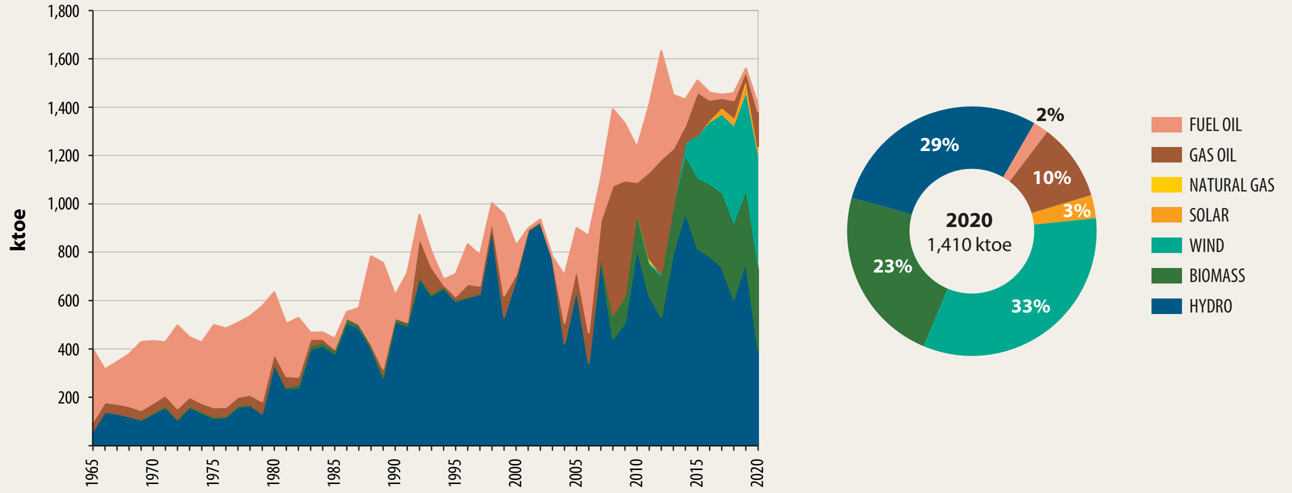
Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

3.2.1. Matrix of inputs for electricity generation

The series of inputs for generation had a net growth for the whole period, going from 399 ktoe (1965) to 1,410 ktoe (2020). The lowest consumption was recorded in 1966 (315 ktoe) and the maximum in 2012 (1,632 ktoe).

The matrix of inputs for generation has varied significantly throughout the years and the diversification of energy sources towards the end of the period, as already mentioned. In 2020, wind energy had the highest share in inputs for generation for the first time (33%), followed by hydropower (29%) and biomass (23%). Oil products also had smaller shares (12%: gas oil 10% and fuel oil 2%) and solar energy (3%).

CHART 10. Inputs for electricity generation.



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 6. Inputs for electricity generation.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hydropower	60.2	335.9	596.4	647.2	817.2	619.9	529.3	798.3	964.9	814.0	782.4	738.4	605.0	762.0	**396.3**
(%)	15%	53%	84%	72%	66%	44%	32%	55%	67%	54%	54%	50%	42%	49%	**29%**
Wind					6.0	9.6	9.7	12.4	63.0	177.6	257.5	324.6	407.0	408.7	**470.9**
(%)					0%	1%	1%	1%	4%	12%	18%	22%	28%	26%	**33%**
Solar									0.3	4.2	13.1	23.1	35.6	36.4	**39.7**
(%)									0%	0%	1%	2%	2%	2%	**3%**
Firewood			5.0	0.8	8.6	1.8	7.0	9.9	2.0	4.8	4.2	1.3	2.4	1.8	**1.6**
(%)			1%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	**0%**
Biomass waste	0.4	5.0	1.8	2.0	121.1	124.3	161.3	171.8	226.1	283.8	292.3	303.6	306.7	284.0	**329.7**
(%)	0%	1%	0%	0%	10%	9%	10%	12%	16%	19%	20%	21%	21%	18%	**23%**
Gas oil	37.3	41.2	14.6	84.3	119.7	356.6	475.9	236.7	69.3	178.9	80.9	38.4	68.8	30.9	**144.5**
(%)	9%	6%	2%	9%	10%	25%	29%	16%	5%	12%	6%	3%	5%	2%	**10%**
Gasoline														0.0	**0.0**
(%)														0%	**0%**
Fuel oil	301.1	252.3	91.5	165.3	143.3	276.7	446.9	221.2	106.6	47.5	30.1	13.7	30.0	9.8	**26.8**
(%)	75%	40%	13%	18%	12%	20%	27%	15%	7%	3%	2%	1%	2%	1%	**2%**
Natural gas				0.6	17.1	19.5	1.7	0.2	0.2	0.0		8.7	2.7	26.4	
(%)				0%	1%	1%	0%	0%	0%	0%		1%	0%	2%	
TOTAL	**399.0**	**634.4**	**709.3**	**900.2**	**1,233.0**	**1,408.4**	**1,631.8**	**1,450.5**	**1,432.4**	**1,510.8**	**1,460.5**	**1,451.8**	**1,458.2**	**1,560.0**	**1,409.5**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTE: Gas oil includes diesel oil until and including 2003.

3.2.2. Matrix of electricity generation by source

The electricity generated in 2020 came mainly from wind energy (40%), which reported a 15% increase (in absolute terms) compared to 2019. In turn, hydroelectricity fell sharply compared to recent years: 30%. This entails a 50% reduction compared to 2019. This is the first time it is displaced from the top of the electricity generation matrix, coming in second. The biomass share grew by 5%, from 15% to 20%, although its growth was 8% in absolute values: from 2,491 GWh to 2,701 GWh.

Electricity from solar photovoltaic energy grew 9% in absolute values, accounting for 3% of the electricity generation matrix. Fossil fuel share rose four percentage points—from 2% to 6%—and its growth was 162% in absolute values: from 315 GWh to 825 GWh.

TABLE 7. Electricity generation by source.

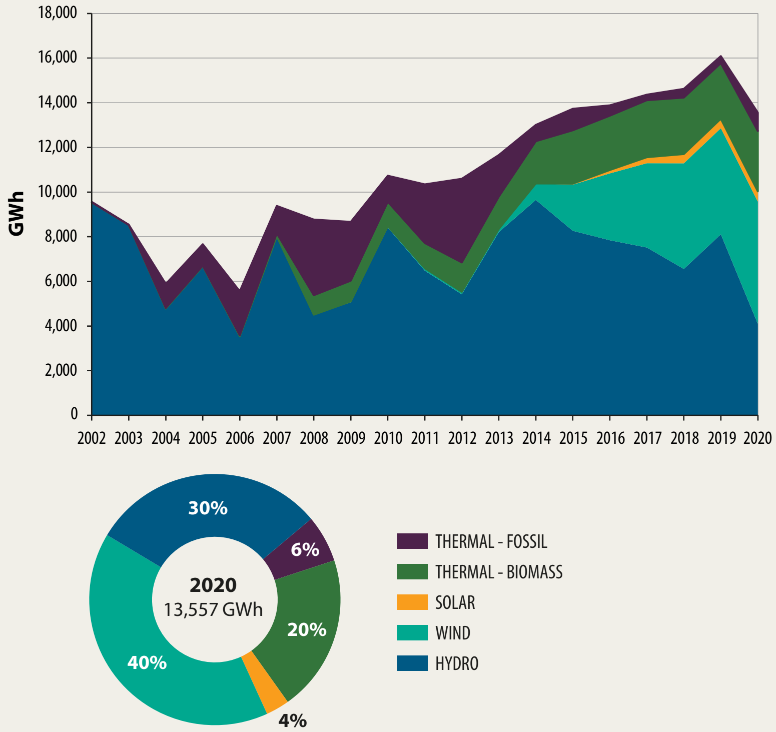
GWh	2002	2003	2004	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Thermal (fossil)	26.4	6.6	1,076.8	956.3	1,165.1	2,627.2	3,748.3	1,859.5	729.8	962.6	463.3	249.2	391.4	314.7	**824.9**
(%)	0%	0%	18%	12%	11%	25%	35%	16%	6%	7%	3%	2%	3%	2%	**6%**
Thermal (biomass)	0.0	0.0	27.3	24.5	1,089.8	1,127.5	1,313.8	1,448.0	1,893.3	2,388.4	2,432.7	2,553.1	2,529.5	2,491.3	**2,700.8**
(%)	0%	0%	0%	0%	10%	11%	12%	12%	15%	17%	18%	18%	17%	15%	**20%**
Hydropower	9,535.3	8,529.5	4,780.7	6,683.6	8,407.2	6,478.9	5,420.9	8,205.9	9,649.1	8,266.0	7,842.2	7,517.9	6,556.6	8,108.3	**4,093.9**
(%)	100%	100%	81%	87%	78%	63%	51%	70%	74%	60%	56%	52%	45%	50%	**30%**
Wind					69.9	111.3	112.5	144.1	732.7	2,065.1	2,994.3	3,774.5	4,732.2	4,752.4	**5,475.5**
(%)					1%	1%	1%	1%	6%	15%	22%	26%	32%	30%	**40%**
Solar									3.4	48.7	151.9	268.6	413.6	423.5	**462.1**
(%)									0%	0%	1%	2%	3%	3%	**4%**
TOTAL	**9,561.7**	**8,536.2**	**5,884.8**	**7,664.4**	**10,732.0**	**10,344.9**	**10,595.4**	**11,657.5**	**13,008.3**	**13,730.8**	**13,884.5**	**14,363.2**	**14,623.2**	**16,090.1**	**13,557.1**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

TABLE 8. Microgeneration of electricity from solar energy.

MWh		2014	2015	2016	2017	2018	2019	2020
Residential	EDG	94	151	352	437	2,203	1,221	**1,536**
	EOU	28	50	50	92	1,441	627	**590**
	TG	**122**	**202**	**402**	**528**	**3,644**	**1,848**	**2,126**
Commercial	EDG	393	1,386	3,051	4,834	9,213	8,719	**10,012**
	EOU	634	1,347	2,222	3,567	3,365	8,678	**8,684**
	TG	**1,027**	**2,734**	**5,274**	**8,401**	**12,578**	**17,396**	**18,696**
Agriculture	EDG	122	321	708	1,070	1,664	2,493	**2,844**
	EOU	19	487	948	1,413	871	3,493	**3,619**
	TG	**141**	**808**	**1,656**	**2,483**	**2,536**	**5,986**	**6,464**
Industrial	EDG	612	1,184	2,076	2,019	1,721	3,671	**3,650**
	EOU	207	373	414	433	787	1,015	**1,085**
	TG	**820**	**1,557**	**2,490**	**2,452**	**2,508**	**4,685**	**4,735**
TOTAL	EDG	1,222	3,043	6,187	8,359	14,802	16,103	**18,043**
	EOU	889	2,258	3,635	5,505	6,464	13,813	**13,979**
	TG	**2,110**	**5,300**	**9,821**	**13,864**	**21,266**	**29,916**	**32,021**

NOTES:
EDG: Electricity delivered to the grid, **EOU:** Electricity for own use, **TG:** Total generation.

CHART 11. Electricity generation by source.



Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

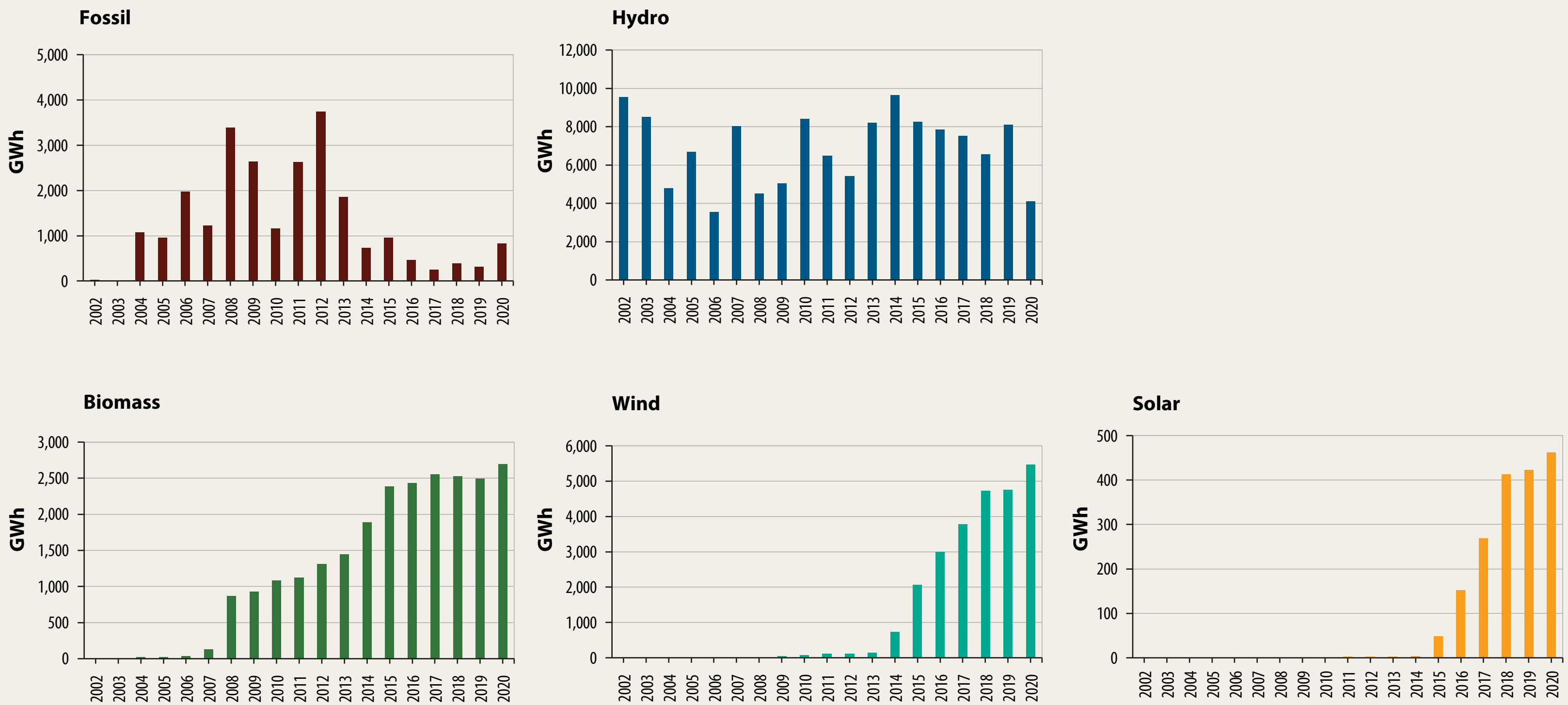
The evolution of the matrix of electricity generation by source also reflects the characteristics mentioned above: variability, complementarity, and diversification of sources. Until the 1980s, electricity generation came mainly from fossil fuels, and as of 1979, hydroelectricity had high shares in the matrix of generation. Additionally, new energy sources have been included over the last few years.

Wind energy, a source used in Uruguay for only 10 years, has become the primary source of electricity generation.

Wind energy: the main source of electricity generation in 2020

Comparing 2012 and 2020 shows that electricity generation in absolute values grew by 28%, but electricity generation from hydropower fell by 24%. However, the share of electricity from fossil fuels in 2012 was 35% and only 6% in 2020. This comparison reflects the share of local sources introduced in the last 15 years. This clearly shows the advantages of diversifying the generation matrix.

CHART 12. Electricity generation from each source.



Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

3.3. Production of oil products

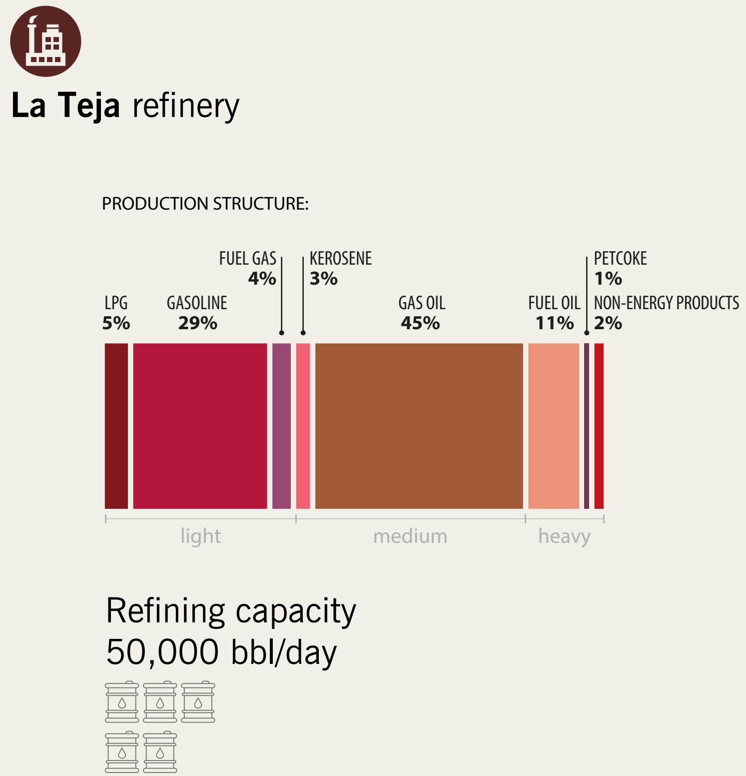
In 2020, the refinery operated as usual in general, in terms of shutdowns. Its production was lower because of the pandemic, as explained above. This health situation affected the consumption of oil products the most in the second two-month period of 2020 due to reduced mobility. Crude oil processing amounted to 1,947 ktoe, down 7% from the previous year, already down 5% from 2018.

Furthermore, 1,935 ktoe of oil products were produced, resulting in 11 ktoe of transformation losses. In 2020, the main product was gas oil (867 ktoe), followed by motor gasoline (561 ktoe) and fuel oil (210 ktoe). To a lesser extent, there was production of LPG (LP gas and propane), kerosene, and jet fuel, among others.

The refining process supplies products that are directly consumed in the process. In 2020, 77 ktoe of fuel gas and 28 ktoe of petcoke were produced. This consumption is recorded in the matrix of results under "own use" in the energy sector. In the case of fuel gas, there is an amount of energy reported as "not used" and another amount recorded as "losses."

The refinery's production structure has changed over these 56 years. Until the early 1980s, it mainly produced fuel oil. However, as of 1983, the main product was gas oil (except for a few specific years). In turn, motor gasoline has come in third in terms of share. However, it has surpassed fuel oil since 2011, moving to second place in the production structure. Crude oil processing and the production of oil products decreased in the years when the refinery had maintenance shutdowns.

CHART 13. La Teja refinery production.



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

4. Energy demand

"Total final consumption" is the consumption of the following sectors: Residential, Commercial/Services/Public sector, Transport, Industrial, Primary activities (agriculture, fishing, mining). It does not include the consumption of the energy sector used for energy generation or transformation (energy consumption of refineries, power plants, etc.), also called "own use" of the sector (it is not the input for transformation). Final energy consumption may apply to energy uses (cooking, lighting, process heat, driving force, etc.) or non-energy uses (lubrication, cleaning, etc.).

Total final consumption increased from 1,715 ktoe in 1965 to 2,677 ktoe in 1999. As of that year, total final consumption started to decrease until and including 2003, when it reached a relative minimum of 2,251 ktoe due to Uruguay's economic crisis at the beginning of the 21st century. This downward trend was reversed in 2004, when it started to grow again; the consumption values prevailing before the crisis were only surpassed in 2007. In 2020, the value was 4,702 ktoe: 2% lower than in 2019. As explained above, there has been no reduction in final energy demand since the early years of the 21st century. The global pandemic is one of the reasons for this reduction in final energy consumption. The first COVID-19 case was reported in Uruguay on 13 March 2020: the government took immediate action. This included reducing mobility, which affected the final energy demand, especially oil products such as gas oil and gasoline: energy sources used for transportation. Another reason is the country's 2020 economic recession when GDP fell by 5.9%. The entire Energy Balance series from 1965 to 2020 has only three such sharp economic downturns: 1982, 1983, and 2002.

CHART 14. Total final consumption.

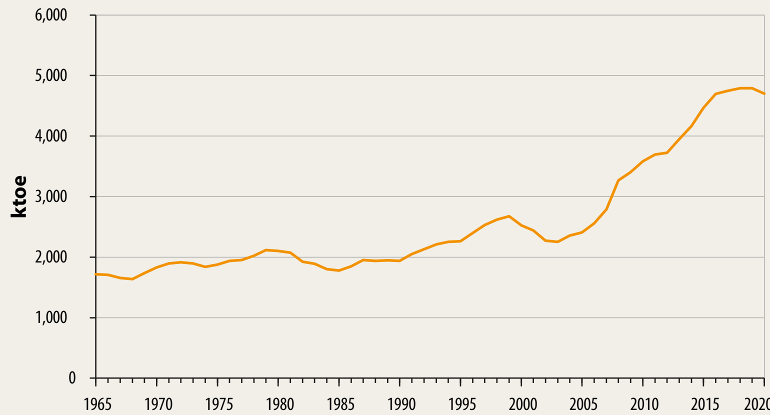


CHART 15. Total final consumption.

Year	ktoe	Year	ktoe	Year	ktoe
1965	1,715.0	1984	1,802.2	2003	2,251.0
1966	1,709.8	1985	1,778.4	2004	2,355.9
1967	1,656.2	1986	1,850.6	2005	2,407.7
1968	1,636.7	1987	1,950.4	2006	2,559.8
1969	1,734.2	1988	1,936.8	2007	2,788.6
1970	1,827.9	1989	1,947.4	2008	3,266.2
1971	1,895.1	1990	1,939.7	2009	3,405.2
1972	1,912.6	1991	2,048.9	2010	3,583.5
1973	1,898.1	1992	2,132.7	2011	3,696.1
1974	1,840.1	1993	2,211.5	2012	3,722.2
1975	1,875.0	1994	2,255.3	2013	3,948.0
1976	1,936.3	1995	2,263.0	2014	4,166.3
1977	1,953.3	1996	2,399.9	2015	4,467.3
1978	2,020.7	1997	2,528.7	2016	4,698.9
1979	2,116.0	1998	2,619.5	2017	4,749.2
1980	2,101.2	1999	2,676.8	2018	4,790.4
1981	2,075.6	2000	2,527.2	2019	4,790.6
1982	1,925.7	2001	2,438.9	**2020**	**4,702.3**
1983	1,889.1	2002	2,272.0		

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

As mentioned above, since 2004, the total final energy consumption has had an upward trend, with a 5% annual average rate. This value exceeded the historical trend, as the 1990s recorded the highest increase—before this decade—with an average rate of 4%. In 2008, there was a 17% increase in total final consumption, mainly associated with the significant growth of the cellulose industry.

In 2020, non-energy final consumption was 96 ktoe, 21% lower than the previous year. As final consumption for non-energy uses is only 2% of the total final consumption, it is not worth analyzing by source. There follows the analysis of final energy consumption and its breakdown by source and by sector.

4.1. Final energy consumption by source

The energy sources consumed in the different activity sectors mainly include oil products, biomass, electricity, biofuels, and natural gas.

In 2020, final energy consumption was headed by biomass (firewood, charcoal, and biomass waste) for the sixth consecutive year. It surpassed oil products (1,808 ktoe and 1,682 ktoe), with shares of up to 39% in each for biomass and 37% for oil products. Electricity consumption came in third (976 ktoe, 21%), while the share of natural gas and biofuels was 1% and 2% respectively. Although the penetration of natural gas has not occurred in Uruguay, biofuels have already surpassed the final demand for natural gas, although they were introduced only a decade ago. It should be noted that the consumption value of firewood that appears in the energy balance for the different sectors is obtained from statistical studies conducted by DNE-MIEM.

Biomass consumption (firewood, charcoal, and biomass waste) has been included in the entire historical series, and, over the last few years, it increased its share in the matrix. In 2020, it reported the highest consumption level. This was determined by biomass waste consumption.

Biomass waste includes forestry and sawmill waste, black liquor, sugar cane bagasse, rice husk, sunflower husk, barley husk, and others. As of 2007, there has been a significant increase in waste consumption in the cellulose industry, mainly black liquor. For 2007 and 2008, the increase rates in biomass waste consumption were 91% and 447%, respectively. This happened again in 2014 and 2015, with increase rates of 30% and 28%. Furthermore, in 2011, consumption fell (3%), which can be explained by the decrease in the gross domestic product in the paper and timber industries, which account for approximately 80% of the biomass waste consumption in the industrial sector.

Historically, oil products have had the highest share in the matrix of final energy consumption. Over the last 19 years, they have behaved similarly to electricity. Their consumption was affected during the crisis at the beginning of the century, with negative rates until 2003. As of 2004, the consumption of oil products increased again, with annual growth rates between 0.4% and 8%. In 2020, the situation of recent years was reversed, and negative rates were again recorded: consumption was 1,682 ktoe, 5% lower than in 2019.

Electricity consumption has had a steady net increase since 1965, except for a slight decrease in 1972, 1982, 1989, and the fall at the beginning of the century for reasons already explained. The analysis of the last 10 years of the series shows that the growth rate was always positive, with an average of 4%, except for 2017 and 2019, when electricity consumption decreased. The historical maximum of electricity consumption was recorded in 2018 (985 ktoe). In particular, the 2006 increase in electricity consumption is associated with a change

Start
Table of Contents
Go back

Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

CHART 16. Final energy consumption by source.

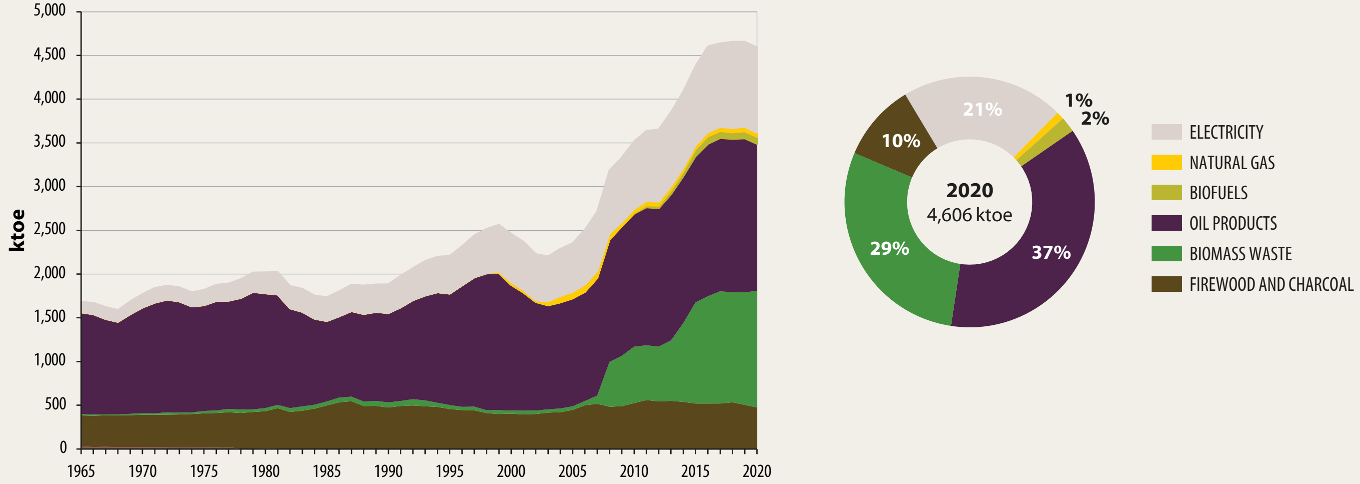


TABLE 9. Final energy consumption by source.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Firewood and charcoal	355.8	424.4	456.1	444.5	524.2	559.3	543.3	549.9	538.2	519.0	519.0	519.5	533.6	503.4	**474.5**
(%)	21%	21%	21%	19%	15%	15%	15%	14%	13%	12%	11%	11%	11%	11%	**10%**
Biomass waste	15.1	35.6	46.0	41.5	645.6	625.8	626.8	690.7	900.9	1,157.6	1,227.5	1,283.0	1,257.7	1,287.4	**1,333.1**
(%)	1%	2%	2%	2%	18%	17%	17%	18%	22%	26%	27%	28%	27%	27%	**29%**
Coal	5.1	2.7	0.3	0.9											
(%)	0%	0%	0%	0%											
Oil products	1,164.1	1,312.9	1,274.5	1,234.5	1,520.5	1,578.0	1,582.0	1,671.4	1,679.4	1,672.4	1,742.1	1,753.4	1,754.2	1,761.4	**1,681.8**
(%)	69%	65%	58%	52%	43%	43%	43%	43%	41%	38%	38%	38%	38%	38%	**37%**
Biofuels					8.8	22.0	29.4	43.8	52.8	78.8	85.2	79.1	74.0	80.3	**79.1**
(%)					0%	1%	1%	1%	1%	2%	2%	2%	2%	2%	**2%**
Natural gas				73.5	45.7	50.0	46.9	46.6	42.8	43.7	47.7	47.0	50.8	49.7	**47.2**
(%)				3%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	**1%**
Coal products	22.6	4.7	0.2	0.9	0.3	0.3	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1	**0.1**
(%)	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%			
Electricity	118.5	239.0	429.8	556.7	772.7	800.3	823.8	847.2	871.3	906.2	980.5	956.1	985.2	973.7	**975.8**
(%)	7%	12%	19%	24%	22%	22%	23%	22%	21%	21%	21%	21%	21%	21%	**21%**
Solar									2.5	2.8	3.2	3.6	4.2	4.8	**5.6**
(%)									0%	0%	0%	0%	0%	0%	**0%**
Industrial waste						2.1	1.6	4.3	3.4	6.0	7.0	6.4	8.7	8.6	**9.3**
(%)						0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
TOTAL	**1,681.2**	**2,019.3**	**2,206.9**	**2,352.5**	**3,517.8**	**3,637.8**	**3,654.0**	**3,854.1**	**4,091.4**	**4,386.6**	**4,612.4**	**4,648.2**	**4,668.5**	**4,669.4**	**4,606.5**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**101%**	**100%**	**100%**	**100%**

NOTE: Manufactured gas is included in coal products in1965, and has been included in oil products in 1980 and 1995. As of 2005, it has been fully replaced by natural gas.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

in the methodology that evaluates nontechnical losses[7], which have been included in the final consumption sectors since that year. The social losses were included in the residential sector. The rest of the nontechnical losses were distributed according to the other sectors' share in electricity consumption. In 2020, electricity grew marginally (0.2%) compared to 2019, but it remains below 2018's demand.

Although natural gas has been part of the energy matrix for almost 20 years, its penetration has been marginal since its appearance in 1998. The highest consumption was recorded in 2006 (84 ktoe) with a 3% share in the matrix of final energy consumption. However, since 2009, its share in the consumption matrix has remained at 1%. One of the main disadvantages of this energy source is that there is only one supplier—Argentina—so it is impossible to negotiate to obtain the minimum conditions that would enable the penetration of this energy source in the country.

From 2010, two new secondary energy sources were bioethanol and biodiesel[8], grouped under "biofuels." After increasing consumption since their first year, in 2016, they recorded a maximum consumption (85 ktoe), which decreased in 2017 and 2018, and rose again in 2019 (80 ktoe). Biofuel consumption dropped in 2020, reaching the 2017 figure of 79 ktoe. However, it has retained a 2% share in final energy consumption for the last five years. It is more consumed than natural gas, a source introduced in the country over 20 years ago. These sources are mainly consumed in blends with fossil fuels: gasoline-bioethanol and gas oil-biodiesel. In 2020 and in terms of volume, the average mixture corresponded to 9.8% bioethanol in motor gasoline and 5.3% biodiesel in gas oil. Introducing biofuels allowed us to meet the demand and reduce fossil fuel consumption, which helped reduce greenhouse gas emissions.

7- Nontechnical losses are associated with consumption of electricity which is not billed.
8- Until BEN 2012, they were called "fuel ethanol" and "B100".

In 2020 and in terms of volume, the average blend included 9.8% bioethanol in motor gasoline and 5.3% biodiesel in gas oil.

Solar thermal energy has been included in the matrix of results since 2014. In 2020, final energy consumption grew by 17% compared to the previous year, reaching 5.6 ktoe, associated with a surface of solar thermal collectors covering approximately 97,061 m^2.

4.2. Final energy consumption by sector

Historically, final energy consumption has been distributed among three sectors with similar shares (residential, transport, and industrial), with the residential sector recording the highest consumption. However, in 1994, transport became the leading consumption sector, closely followed by the residential sector until 2008, when the consumption structure changed again with the industrial sector's significant growth.

From 2007-2008, the consumption of the industrial sector began to grow exponentially, almost doubling in just one year. Over the last thirteen years, the final energy consumption of the industrial sector went from 626 ktoe (2007) to 2,030 ktoe (2020), with two clear growth periods (2008-2010 and 2014-2015) due to the new cellulose plants in the country.

It is noted that, although the new cellulose plants had a significant impact on the energy matrix, they are self-sufficient, as over 90% of their consumption comes from their own energy sources. In turn, part of the electricity generated in these plants is delivered to the SIN.

Additionally, as of 2013, final energy consumption has been reported with a broader breakdown of sectors. Since they represent marginal values, sector consumptions lower than 1 ktoe are not reported, except when they correspond only to one subsector. In other cases, there is no breakdown if the data correspond only to one company by sector (group consumption must then be reported) or if there is no relevant information for its classification.

Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

CHART 17. Final energy consumption by sector.

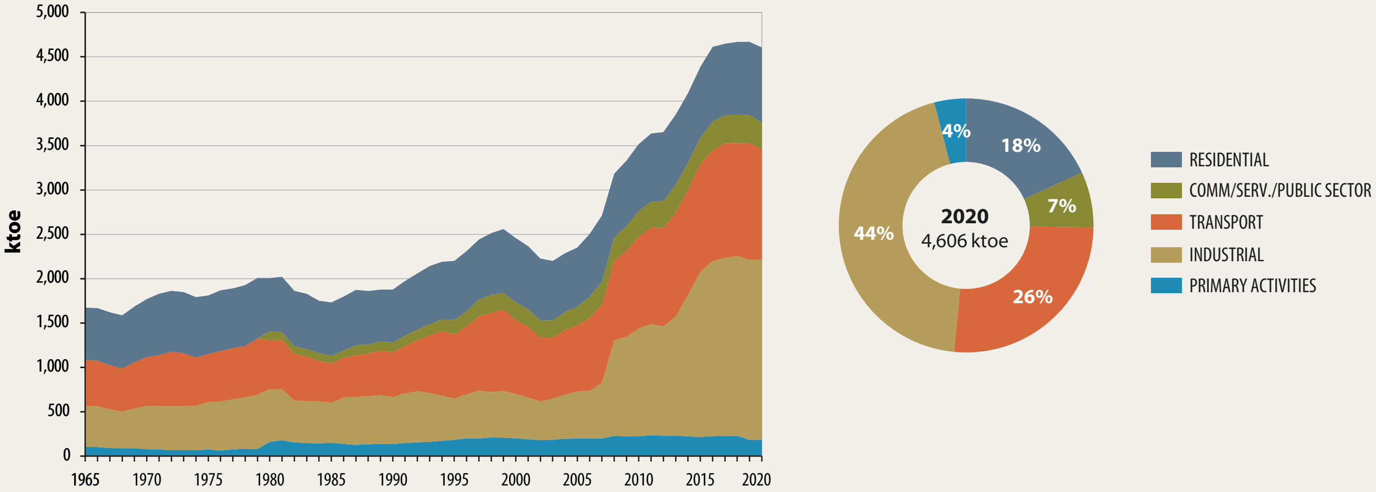


TABLE 10. Final energy consumption by sector.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Residential	589.3	601.7	666.1	667.3	755.7	768.5	777.1	793.2	786.3	796.2	842.7	805.9	820.7	824.9	**847.6**
(%)	35%	30%	30%	28%	21%	21%	21%	21%	19%	18%	18%	17%	18%	18%	**18%**
Commercial/services/ public sector	*	99.3	160.8	207.4	291.6	293.4	305.4	310.8	305.4	299.2	323.9	314.0	318.7	316.4	**302.2**
(%)		5%	7%	9%	8%	8%	8%	8%	7%	7%	7%	7%	7%	7%	**7%**
Transport	518.8	550.9	724.7	748.2	1,032.3	1,085.7	1,109.3	1,174.7	1,182.3	1,216.4	1,247.4	1,294.2	1,274.4	1,316.9	**1,240.9**
(%)	31%	27%	33%	32%	29%	30%	30%	30%	29%	28%	27%	28%	27%	28%	**27%**
Industrial	463.6	594.4	465.5	529.9	1,213.7	1,255.8	1,233.0	1,344.9	1,595.6	1,859.5	1,974.0	2,005.7	2,027.4	2,029.9	**2,030.0**
(%)	28%	29%	21%	23%	35%	35%	34%	35%	39%	42%	43%	43%	43%	43%	**44%**
Primary activities	102.1	160.4	182.5	197.9	224.5	234.4	229.0	230.3	221.5	215.3	224.4	228.4	227.3	181.3	**185.8**
(%)	6%	8%	8%	8%	6%	6%	6%	6%	5%	5%	5%	5%	5%	4%	**4%**
Non-specified	7.3	12.5	7.3	1.8	0.0	0.0	0.2	0.2	0.3						
(%)	0%	1%	0%	0%	0%	0%	0%	0%	0%						
TOTAL	**1,681.1**	**2,019.2**	**2,206.9**	**2,352.5**	**3,517.8**	**3,637.8**	**3,654.0**	**3,854.1**	**4,091.4**	**4,386.6**	**4,612.4**	**4,648.2**	**4,668.5**	**4,669.4**	**4,606.5**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTE: In 1965, the final energy consumption of the commercial/services/public sector was included in the residential sector.

Start
Table of Contents
Go back

Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

4.2.1. Residential sector

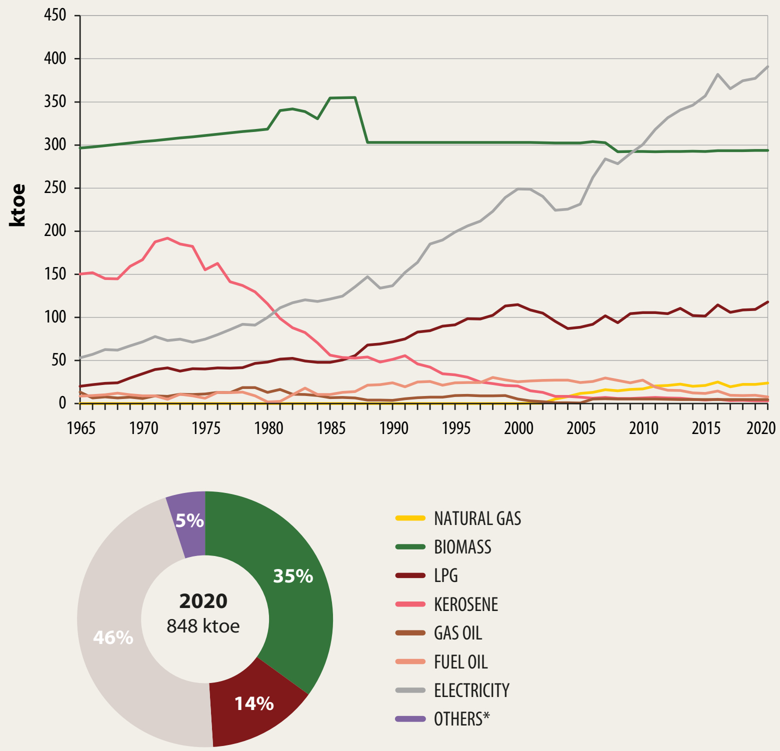
The final energy consumption of the residential sector was 848 ktoe in 2020, 3% higher than the previous year. Although the consumption of the residential sector includes a wide variety of sources, the main ones are three or four. In the first years of the historical series, between 1965 and 1980, the highest consumption corresponded to firewood, followed by kerosene and, to a lesser extent, electricity and LPG (mainly LP gas). However, electricity and LPG consumption have increased throughout the years, along with constant consumption of firewood and decreasing kerosene consumption. In this way, as of 2010, the primary energy source consumed in the residential sector has been electricity, followed by biomass (firewood and biomass waste) and LPG.

Once again, it is worth noting that firewood and biomass waste consumption is evaluated through surveys. Therefore, the drop in biomass consumption reported since 2006 is not connected to changing consumption patterns but to a change in the evaluation methodology. In the case of firewood and until 2005, the value recorded in the 1988 survey (302 ktoe) remained the same. As of 2006, the results of the Energy Use and Consumption Survey (295 ktoe) were included. As of 2008, the consumption included in the updated version of the survey was also considered (284 ktoe). Biomass waste was included in 2006, assessing data from the survey mentioned above. In turn, a new residential survey was conducted in 2013, which reported firewood and biomass waste consumption results similar to previous years. In the 2020 balance, biomass (wood, charcoal, and biomass waste) accounts for 35% of residential consumption.

Other sources used in the residential sector are gas oil and fuel oil, primarily for heating and water heating. Their joint share has been between 2% and 6% throughout the period (1965-2020) surveyed, with a consumption of 5 ktoe and 8 ktoe in 2020. Natural gas was first used in the residential sector in 2000. Its current share is only 3% (24 ktoe). This source has ranged between 2% and 3% of the residential sector consumption since 2005. In early 2005, the manufactured gas used in Montevideo was replaced by natural gas.

Residential consumption is reported for Montevideo and the rest of the country following the breakdown implemented in 2013. Approximately a third of the residential consumption corresponded to Montevideo. Regarding electricity and LPG (LP gas and propane), consumption was similar in Montevideo

CHART 18. Final energy consumption by source, residential sector.



NOTE: For the 2020 chart, the category "Others" includes natural gas, solar, gasoline, kerosene, gas oil and fuel oil.

BEN 2020
Start
Table of Contents
Go back

Search
Print

and the rest of the country (higher than 40% and lower than 60%, respectively). In comparison, most of the natural gas was consumed in the capital (91%), and most of the firewood and electricity was reported outside the capital (80% and 60%).

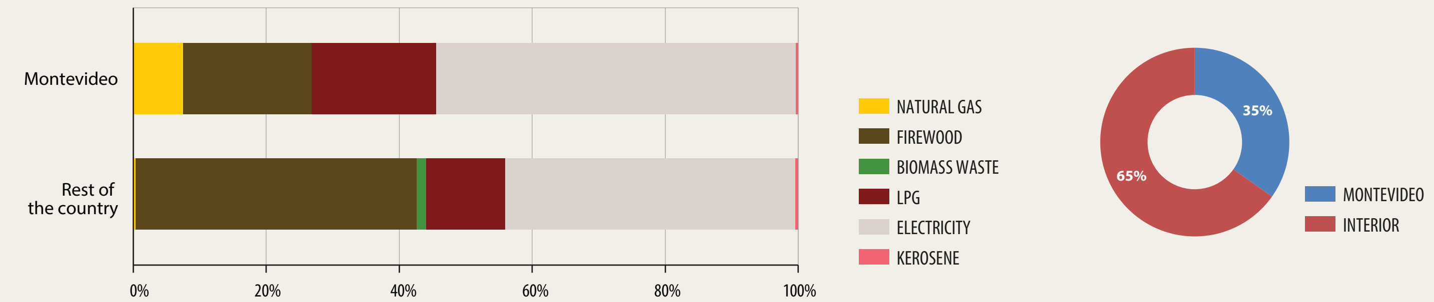
From a regional standpoint, over half of Montevideo's residential consumption was electricity, followed by firewood, LPG, and natural gas. In the rest of the country, the main energy sources used in households were electricity and firewood and, to a lesser extent, LPG and biomass waste.

In the case of solar, gas oil, fuel oil, and charcoal consumption of the residential sector, there was no breakdown for Montevideo and the rest of the country as data were insufficient for this classification. For other energy sources (such as gasoline and biodiesel), there was no breakdown because their consumption was lower than 1 ktoe.

The chart shows that although approximately 40% of the total population lives in Montevideo, consumption patterns are hugely different. Outside the capital, firewood is the most widely used energy source, whereas electricity is the main source in Montevideo. It seems reasonable that consumption outside the capital should double the consumption in Montevideo, given the characteristics of both sources in terms of efficiency.

Before analyzing consumption variation in the various sources, it is crucial to consider that on 13 March 2020, Uruguay detected its first COVID-19 case, which resulted in several actions that affected energy consumption patterns. Regarding this sector, as people had to stay at home for more extended periods, we might think that this would lead to higher energy consumption. The total growth of 3% is in line with historical growths. This and the fact that the winter of 2020 was colder than in 2019 explain the increase in LPG and electricity consumption. Therefore, the effect of the pandemic does not fully account for this consumption behavior.

CHART 19. Breakdown of consumption in the residential sector, 2020.



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 11. Final energy consumption - residential sector.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Natural gas				11.8	17.2	17.2	21.0	22.6	20.3	21.2	25.0	19.6	22.3	22.2	**23.8**
(%)				2%	2%	2%	3%	3%	3%	3%	3%	2%	3%	3%	**3%**
Solar									2.1	2.4	2.7	3.0	3.5	4.0	**4.7**
(%)									0%	0%	0%	0%	0%	0%	**1%**
Firewood and charcoal	296.5	318.3	303.0	302.3	285.0	285.0	284.9	284.9	285.1	285.0	285.8	285.8	285.8	286.2	**286.1**
(%)	54%	53%	45%	45%	38%	38%	37%	36%	36%	36%	34%	35%	35%	35%	**34%**
Biomass waste					7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	**7.6**
(%)					1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	**1%**
LPG	20.1	48.2	91.5	88.7	105.7	105.7	104.3	110.7	102.3	101.6	114.7	106.0	108.8	109.4	**118.1**
(%)	4%	8%	14%	13%	14%	14%	13%	14%	13%	13%	14%	13%	13%	13%	**14%**
Gasoline					0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.4	**0.3**
(%)					0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Kerosene	150.2	115.7	33.4	7.4	6.7	6.7	6.6	6.3	5.1	4.3	5.2	3.5	3.7	3.2	**3.3**
(%)	27%	19%	5%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	**0%**
Gas oil	13.5	13.1	9.5	0.9	5.5	5.5	5.1	4.9	4.8	4.8	4.8	4.9	4.8	4.8	**4.7**
(%)	2%	2%	1%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	**1%**
Fuel oil	8.9	1.9	24.1	24.6	27.3	27.3	15.6	15.4	12.4	12.0	14.6	9.7	9.3	9.7	**8.0**
(%)	2%	0%	4%	4%	4%	4%	2%	2%	2%	2%	2%	1%	1%	1%	**1%**
Manufactured gas	9.5	4.5	5.4	0.0											
(%)	2%	1%	1%	0%											
Electricity	53.1	100.1	199.2	231.6	300.5	300.5	331.7	340.5	346.3	357.0	381.9	365.4	374.6	377.4	**391.0**
(%)	10%	17%	30%	35%	40%	40%	43%	43%	44%	45%	45%	45%	46%	46%	**46%**
TOTAL	**551.8**	**601.8**	**666.1**	**667.3**	**755.7**	**755.7**	**777.1**	**793.2**	**786.3**	**796.2**	**842.7**	**805.9**	**820.7**	**824.9**	**847.6**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTES: 1) In 1965, the consumption of kerosene, diesel oil, gas oil, fuel oil and manufactured gas in the commercial/services sector are included in the residential sector. **2)** As of 2010, gas oil includes biodiesel, and motor gasoline includes bioethanol. **3)** Until and including 2013, gas oil consumption includes diesel oil.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

4.2.2. Commercial/services/public sector

The final energy consumption of the commercial/services/public sector was 302 ktoe in 2020, 4% lower than in 2019.

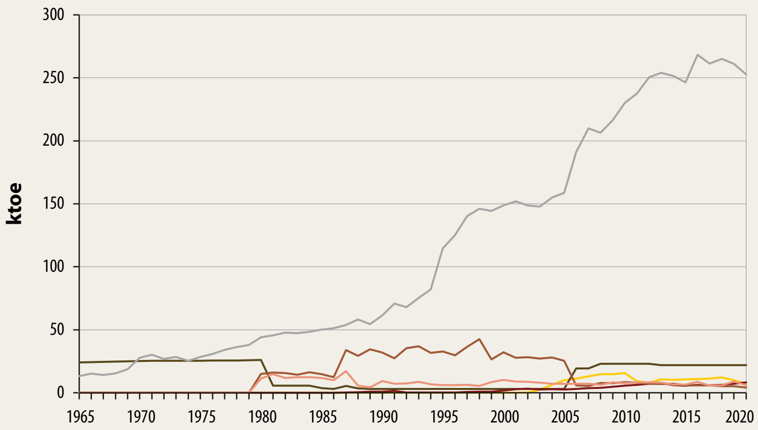
Before 2006, the sector's final energy consumption corresponded mainly to secondary energy sources, reaching shares of 98%. In 2006, firewood consumption information arising from the results of the "Energy Use and Consumption Survey" was included. Because of this modification, the share of secondary energy decreased, whereas the share of primary energy grew, mainly firewood, as natural gas had no significant variations. It must be noted that firewood consumption has been recorded since 2006. It is associated with a methodology change (including a source not considered before) and not with a modification in the sector's consumption patterns.

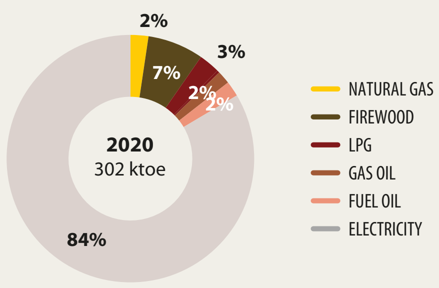
The analysis of the commercial/services/public sector's global consumption shows the importance of electricity. It has been historically the primary energy source, presenting a steady net increase throughout the series. In 2020, consumption reached 253 ktoe with a share of 85%, 3% lower than the electricity consumption in 2019, when this consumption decreased (1%). Since 2006, the share of electricity in the sector's final consumption has remained above 80%.

To a lesser extent, firewood consumption was 22 ktoe in 2020. This value has remained constant over the last seven years and corresponds to the results arising from the 2013 survey by sector. As mentioned above, significant changes in firewood consumption in the 1965-2020 series result from new survey data and not changes in consumption patterns.

The other energy sources currently consumed in the sector (solar, gas oil, fuel oil, LPG, gasoline, kerosene, and natural gas) had, as a whole, a 9% share in 2020: there was a 17% decrease compared to 2019.

CHART 20. Final energy consumption by source, commercial/services/public sector.





Ministerio de Industria, Energía y Minería

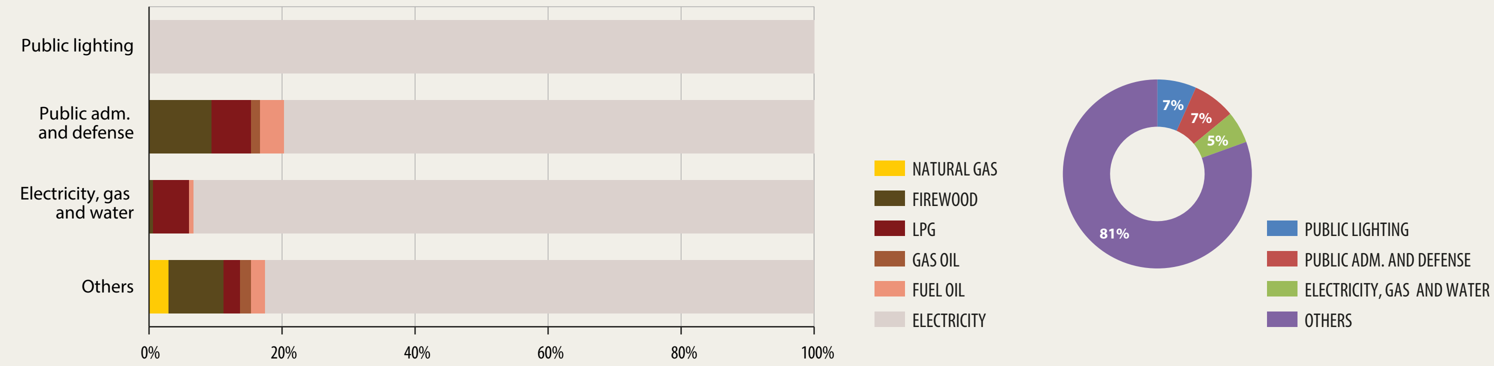
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Consumption has been reported in four subsectors within the commercial/services/public sector as of 2013: “public lighting”, “public administration and defense,” “electricity, gas and water,” and “others”. The first two subsectors had a 7% share each in the sector’s consumption matrix, while “electricity, gas, and water” recorded only 5% of consumption in 2020. Additionally, the subsector “others,” which includes all energy consumption items that do not correspond to the previous categories, accounted for most consumption in the sector (81%).

We can derive that electricity was the main energy consumed in 2020 after analyzing the share of each subsector and their consumption structure, as shown in the charts above. In fact, it was the only energy source used in “public lighting.” For “public administration and defense,” in addition to electricity (80%), there was consumption of firewood (9%), fuel oil (4%), gas oil (1%), and LPG (6%). A minimal consumption share of firewood and fuel oil was added to electricity consumption (93%) under “electricity, gas, and water.” In turn, the subsector “others” had the following consumption matrix: electricity (82%), firewood (8%), fuel oil (2%), LPG (3%), natural gas (3%), and gas oil (2%). Regarding sources, most of them recorded over 80% of their consumption in the subsector “others.”

There is no breakdown for solar energy (0.8 ktoe) and kerosene (0.04 ktoe) due to their small values (less than 1 ktoe). Charcoal consumption in the commercial/services/public sector was negligible in 2020, thus included in the “Others” category.

CHART 21. Breakdown of consumption in the commercial/services/public sector, 2020.



BEN 2020

Start
Table of Contents
Go back

1 INTRODUCTION
2 INFRASTRUCTURE OF THE URUGUAYAN ENERGY SYSTEM
3 ENERGY SUPPLY
4 ENERGY DEMAND
5 CO_2 EMISSIONS
6 INDICATORS
7 SUSTAINABLE DEVELOPMENT GOAL 7 (SDG 7)
8 METHODOLOGY
ANNEX I SUPLEMMENTARY INFORMATION
ANNEX II MATRICES AND FLOW CHARTS

Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 12. Final energy consumption commercial/services/public sector.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Natural gas				10.1	15.7	9.2	8.1	10.7	10.3	10.8	11.0	11.4	12.2	10.0	**7.1**
(%)				5%	5%	3%	3%	3%	3%	4%	3%	4%	4%	3%	**2%**
Solar									0.4	0.4	0.5	0.5	0.6	0.7	**0.8**
(%)									0%	0%	0%	0%	0%	0%	**0%**
Firewood and charcoal	24.2	26.1	3.1	3.1	23.1	23.1	23.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	**22.1**
(%)	64%	26%	2%	1%	8%	8%	8%	7%	7%	7%	7%	7%	7%	7%	**7%**
LPG			0.3	2.8	5.7	6.4	7.3	7.9	6.2	5.8	6.3	6.0	6.4	7.2	**8.3**
(%)			0%	1%	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	**3%**
Gasoline					0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	**1.0**
(%)					0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Kerosene	*	0.0	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	**0.0**
(%)		0.0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Gas oil	*	15.0	32.8	25.4	8.6	8.1	7.3	7.1	7.2	6.2	5.9	5.9	5.3	5.2	**4.2**
(%)		15%	20%	12%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	**1%**
Fuel oil	*	11.3	6.2	7.3	7.7	8.3	8.3	8.1	6.7	6.6	8.7	5.7	6.0	8.9	**6.1**
(%)		0.1	4%	4%	3%	3%	3%	3%	2%	2%	3%	2%	2%	3%	**2%**
Manufactured gas	*	2.7	3.4	0.0											
(%)		3%	2%	0%											
Electricity	13.4	44.1	114.7	158.6	230.1	237.5	250.4	254.0	251.5	246.3	268.3	261.3	264.9	261.0	**252.6**
(%)	0.4	0.4	71%	76%	79%	81%	82%	82%	82%	82%	83%	83%	83%	83%	**85%**
TOTAL	**37.6**	**99.2**	**160.8**	**207.4**	**291.6**	**293.4**	**305.4**	**310.8**	**305.4**	**299.2**	**323.9**	**314.0**	**318.7**	**316.4**	**302.2**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTES: 1) In 1965, the consumption of kerosene, diesel oil, gas oil, fuel oil and manufactured gas in the commercial / services / public sector was included in the residential sector. **2)** As of 2010, gas oil includes biodiesel, and motor gasoline includes bioethanol. **3)** Until 2013, gas oil consumption includes diesel oil.

Ministerio de Industria, Energía y Minería

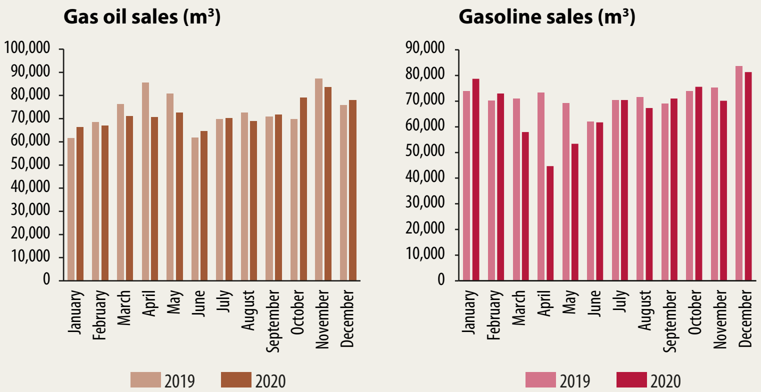
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

4.2.3. Transport sector

The final energy consumption of the transport sector was 1,241 ktoe in 2020: 6% lower than the previous year. It corresponded entirely to secondary energy sources, mainly gas oil and motor gasoline.

This sector was among the most affected by mobility reduction during the pandemic stage. The most affected energy sources were gasoline (8% drop) and gas oil (4% drop). The effect of the mobility restriction was more significant in March, April, and May.

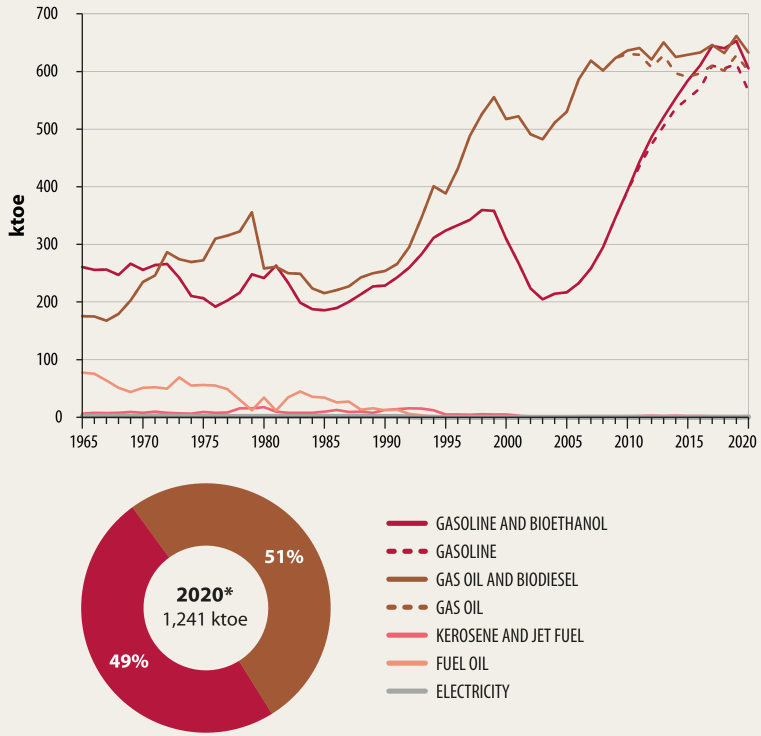
CHART 22. Gasoline and gas oil sales comparison, years 2019-2020.



The share of the different energy sources has varied dramatically from 1965 to 2020. At the beginning of the period, motor gasoline was the source with the highest consumption. However, this has changed since 1972, and gas oil has become the most consumed source in the sector. This situation remained constant until 1980-1981 when both consumptions were almost equal. However, the gap increased in 1982, following an increase in gas oil consumption. With the 2002 crisis, the demand for both fuels dropped, more significantly in the case of gasoline. This situation set a more definite difference in the consumption of both sources.

As of 2004, the upward trend resumed for both sources, and gasoline had the highest growth rates. This reduced the gap between gasoline and gas oil once again. This behavior is directly influenced by the fleet of vehicles, both in size and share according to the fuel used. Over the past 15 years, annual sales of new vehicles have grown 340%. Considering fuel, in 2005, 75% of sales corresponded to gasoline vehicles, and this share increased to 99% in 2010. This trend changed slightly in 2020: new gasoline vehicles sold accounted for 91% of the total light vehicles (cars, SUVs, utility vehicles, pickups), whereas hybrids reached 2%.

CHART 23. Final energy consumption by source, transport sector.



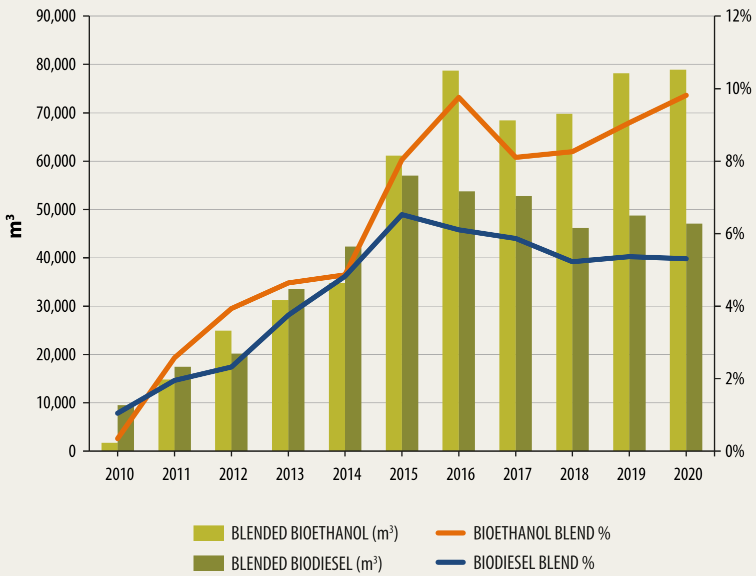
***NOTE:** 46% gasoline; 3% bioethanol; 48% gas oil ; 3% biodiesel.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Biofuels (bioethanol and biodiesel) have been included in the final consumption matrix since 2010. Their share in the transport sector increased from 1% (2010) to 6% (2015) and remained constant until 2020. For both biofuels, consumption went from 7 ktoe to 71 ktoe in these ten years. These sources are mainly consumed in blends with fossil fuels, gasoline-bioethanol, and gas oil-biodiesel; this made it possible to meet the demand and reduce fossil fuel consumption.

CHART 24. Biofuels consumption - blend percentages.



The mixture percentage recorded in 2020 was 9.8% for bioethanol in gasoline and 5.3% for biodiesel in gas oil.
In 2020, the transport sector had a final consumption of 565 ktoe of gasoline and 601 ktoe of gas oil: 46% and 48% shares. Gas oil consumption has increased and decreased in recent years; on the contrary, gasoline consumption dropped for the first time in 2018, after 14 years of continuous growth. In 2020, gas oil (4%) and gasoline (8%) dropped compared to 2019. The trend of recent years has led to unequal consumption of both fuels in 2017. However, the sharp drop in gasoline consumption in 2020 distanced the fuels again. The same trend is observed when fossil fuels are considered blended with biofuels (gasoline-bioethanol and gas oil-biodiesel).

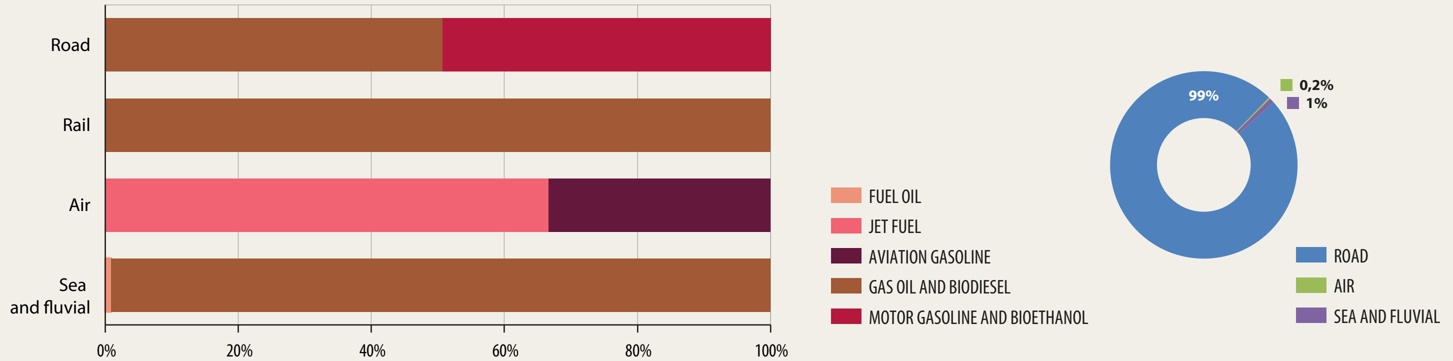
The other sources used in the transport sector are jet fuels and aviation gasoline. In the last few years, we have worked to improve the estimation of the consumption of fuels for agricultural aircraft through surveys conducted in the sector. Therefore, each new BEN includes the estimates for the new year and the reclassification and correction of consumption from the transport sector to the agricultural sector, if applicable. Although the change has been small in absolute values (around 1 ktoe), it is a significant percentage regarding the final energy consumption of each fuel (approximately 20% for jet fuel and 50% for aviation gasoline).

Additionally, electricity reached a value of 0.2 ktoe in 2020. The BEN historical series shows electricity consumption in the transport sector from 1965 to 1992, after which the use of electric vehicles was discontinued. The estimation of electricity consumption in the transport sector from 2016 onwards is resumed and included in the BEN. These values remain low compared to other energy sources. Electric vehicles are currently used in public transport, in UTE's fleet, and by private owners. Before 2016, these consumptions were recorded in the residential and commercial/services/public sector.

Consumption in the transport sector has been reported since 2013, with a breakdown by means: "road," "rail," "air," "sea and river." Road transport consumption represented almost the total consumption of the sector (99%) of gas oil and gasoline mixed with biofuels. In turn, jet fuel and aviation gasoline consumption corresponded entirely to air transport. In the case of rail, air, and sea transport, consumption corresponded to gas oil. In 2019, no fuel oil was consumed in the transport sector, which was the case in previous years for sea and fluvial transportation. However, 0.1 ktoe of this source was consumed in 2020.

The energy balance methodology (IRES/OLADE) States that the consumption of air and fluvial transportation whose airport/port of departure is different from the airport/port of arrival should not be considered as final consumption but as a bunker.

CHART 25. Breakdown of consumption in the transport sector, 2020.



NOTE: Gas oil used in sea and fluvial transportation does not include biodiesel.

Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 13. Final energy consumption, transport sector.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Aviation gasoline		6.4	3.2	2.2	2.6	2.4	2.9	2.9	2.5	2.5	1.1	1.1	1.1	1.0	**1.0**
(%)		1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Motor gasoline	260.5	235.4	320.6	214.6	389.6	433.4	470.7	502.2	533.7	550.7	569.9	609.2	604.2	612.7	**565.1**
(%)	50%	43%	44%	29%	38%	40%	42%	43%	45%	45%	46%	47%	47%	47%	**47%**
Bioethanol					0.9	7.5	12.5	15.6	17.5	30.8	39.6	34.3	34.8	39.4	**39.6**
(%)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Gas oil	175.3	258.1	388.1	530.0	630.3	629.2	607.2	628.1	597.1	590.8	596.8	610.5	601.1	628.2	**601.1**
(%)	34%	47%	54%	71%	61%	58%	55%	53%	51%	49%	48%	47%	47%	47%	**47%**
Biodiesel					6.3	11.5	13.4	22.4	28.0	38.1	36.3	35.5	30.8	33.4	**31.8**
(%)					1%	1%	1%	2%	2%	3%	3%	3%	3%	3%	**3%**
Kerosene	3.4	15.6													
(%)	1%	3%													
Jet fuel			12.0	1.4	1.7	1.7	2.4	2.9	2.2	2.7	2.2	2.3	2.0	2.1	**2.0**
(%)			2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Fuel oil	77.5	34.0	0.8		0.9	0.0	0.2	0.6	1.3	0.8	1.5	1.3	0.3		**0.1**
(%)	15%	6%	0%		0%	0%	0%	0%	0%	0%	0%	0%	0%		**0%**
Electricity	2.1	1.5									0.0	0.0	0.1	0.1	**0.2**
(%)	0%	0%									0%	0%	0%	0%	**0%**
TOTAL	**518.8**	**551.0**	**724.7**	**748.2**	**1,032.3**	**1,085.7**	**1,109.3**	**1,174.7**	**1,182.3**	**1,216.4**	**1,247.4**	**1,294.2**	**1,274.4**	**1,316.9**	**1,240.9**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTES: 1) Until and including 2013, gas oil consumption includes diesel oil. **2)** Electricity consumption associated with transportation since 2016 includes captive and privates fleets. For previous years, it is very small and is included within the residential and commercial / services / public sector sectors.

TABLE 14. Biofuels consumption - blend percentages

▸DOWNLOAD spreadsheet 01 ▸DOWNLOAD spreadsheet 02

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bioethanol production (m^3)	13,225	16,084	20,040	28,430	42,549	71,542	78,630	70,144	80,375	82,062	**78,454**
Blended bioethanol (m^3)	1,777	14,806	24,920	31,254	34,754	61,176	78,735	68,452	69,763	78,154	**78,907**
Commercialized gasoline with bioethanol (m^3)	503,919	574,399	633,804	673,787	714,442	760,950	806,944	844,712	844,886	862,722	**804,077**
Bioethanol blend percentage (%)	**0.4%**	**2.6%**	**3.9%**	**4.6%**	**4.9%**	**8.0%**	**9.8%**	**8.1%**	**8.3%**	**9.1%**	**9.8%**
Biodiesel production (m^3)	11,068	18,202	20,585	35,241	45,234	57,554	53,482	52,848	47,923	49,976	**46,112**
Blended biodiesel (m^3)	9,549	17,489	20,227	33,569	42,319	57,002	53,749	52,745	46,189	48,769	**47,070**
Commercialized gas oil without biodiesel (m^3)	66,678	68,886	62,355	60,950	49,582	45,588	38,743	44,572	44,714	41,358	**37,814**
Commercialized gas oil with biodiesel (m^3)	908,827	895,196	871,954	894,564	877,096	873,711	880,317	899,373	883,402	908,659	**886,730**
Biodiesel blend percentage (%)	**1.1%**	**2.0%**	**2.3%**	**3.8%**	**4.8%**	**6.5%**	**6.1%**	**5.9%**	**5.2%**	**5.4%**	**5.3%**

NOTES: 1) For years when the volume of blended biofuels exceeds production, the diference is mainly due to stock change. **2)** The global blend percentage is represented for the total gasoline and not by type of gasoline (super, premium). **3)** For the purposes of the calculation, the total amount of gasoline sold is used. In the early years, bioethanol was not blended in all commercialized gasoline. **4)** Biodiesel is blended in all the gas oil to be used as "gas oil 50S", or as "regular gas oil" until 2013. Marine gas oil and imported gas oil do not contain biodiesel.

BEN 2020
Start
Table of Contents
Go back
1 INTRODUCTION
2 INFRASTRUCTURE OF THE URUGUAYAN ENERGY SYSTEM
3 ENERGY SUPPLY
4 ENERGY DEMAND
5 CO_2 EMISSIONS
6 INDICATORS
7 SUSTAINABLE DEVELOPMENT GOAL 7 (SDG 7)
8 METHODOLOGY
ANNEX I SUPLEMMENTARY INFORMATION
ANNEX II MATRICES AND FLOW CHARTS
Search
Print

Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

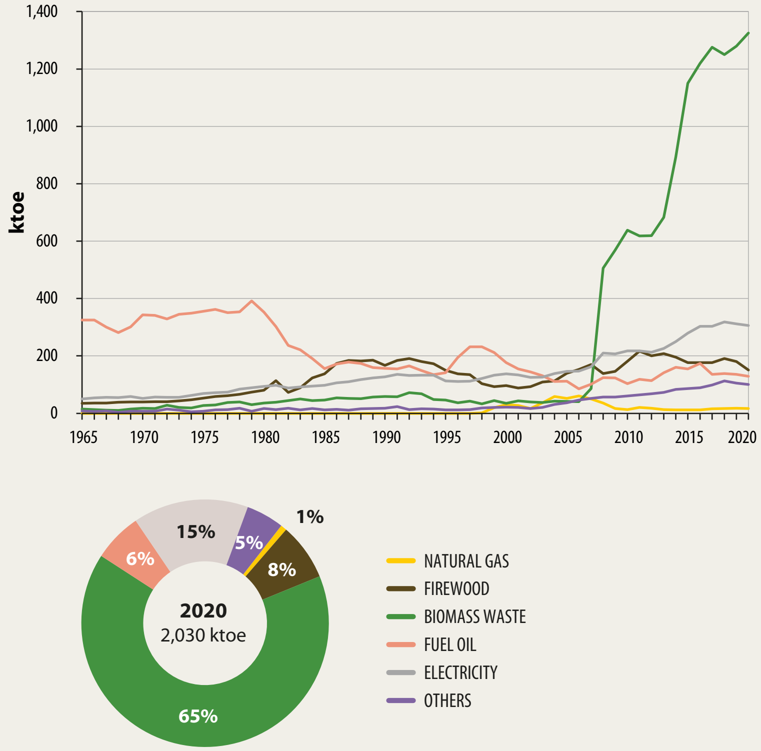
4.2.4. Industrial sector

The final energy consumption of the industrial sector was 2,030 ktoe in 2020, almost the same as in 2019. Please note that the industrial sector includes the manufacturing industry and the construction sector. The main source consumed in 2020 was biomass waste, representing 65% of the total industrial consumption. The following consumption in order of importance corresponded to electricity (15%), followed by firewood (8%) and fuel oil (6%).

In the 1965-2020 period, the industrial sector recorded a significant fluctuation in its energy consumption of the various sources. In the first years of this period, fuel oil was the industry's most widely used energy source, with a 70% share. It is essential to note the years when the consumption of firewood and electricity was higher than other sources (1986-1995 and 2003-2007) and the complementarity between fuel oil and firewood consumption throughout the years.

Biomass waste (rice and sunflower husk, sugar cane bagasse, black liquor, odorous gases, methanol, barley husk, and waste from the timber industry) has historically had a low consumption in the industry with shares of less than 14% up to and including 2007. In 2008, biomass waste consumption peaked, mainly due to the growth of black liquor consumption in the cellulose industry. Additionally, the consumption of forestry and sawmill waste, which was not recorded in previous BEN editions, was first recorded in 2008. In 2010, the consumption of biomass waste alone (638 ktoe) already exceeded the industrial sector's total consumption in 2007 (626 ktoe). In later years, the consumption of said source continued to increase until it reached 1,326 ktoe in 2020. As already mentioned, this significant growth experienced by biomass waste since 2008 has transformed the industrial sector into the leading sector in energy consumption.

CHART 26. Final energy consumption by source, industrial sector.



NOTE: "others" includes gas oil, petcoke, LP gas, propane, and industrial waste.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Electricity reported its maximum share in industrial consumption in 2002 (29%) and then decreased to 15-16% in the last seven years. Despite this percentage decrease, absolute electricity consumption has grown steadily, reaching its maximum value in 2018 (319 ktoe). In 2020, it dropped 2% compared to 2019, reaching a 306 ktoe value.

In the last decade, electricity autoproduction has developed significantly in the industrial sector; this is the electricity generated by the establishments themselves, without joining the grid. Between 1965 and 1980, the share of electricity from autoproduction remained between 10% and 15% compared to industrial electricity consumption and then fell to shares lower than 10% for almost 30 years. As of 2008, the share of electricity from autoproduction grew to between 30% and 35%, and from 2014 to values greater than 40% of the electricity consumption in the industry. Therefore, in the last seven years, industrial establishments generated almost half the electricity they consumed (47%-49%).

In turn, firewood consumption increased and reached a 29% share in 2006, dropped to 9% in 2016, and remained the same until 2019. In 2020, it dropped again in relative terms, reaching an 8% share, but it also decreased in absolute terms by 16%, reaching 151 ktoe, similar to the value recorded in 2009.

Regarding fuel oil, its highest historical consumption has been in the industrial sector, with shares over 70%. As mentioned above, its consumption was especially significant in the first years of the series, with shares lower than 10% from 2010. In 2020, fuel oil consumption accounted for 6% of final energy consumption in the industrial sector.

Industrial consumption for 2020: 48% of electricity was self-produced and 100% of fuel oil was supplied by ANCAP.

Natural gas was introduced in Uruguay at the end of 1998. In 2004, it had a 12% share of industrial consumption and then decreased to 1% in 2010. This percentage remained the same until 2020. The reduction can be partly explained by the decrease in consumption and the increase in the sector's total consumption. As already mentioned, we must consider the difficulties entailed by Argentina's natural gas supply (sole provider of this source).

Other energy sources consumed by the industry have been gas oil, petcoke, LPG (LP gas and propane). Petcoke consumption has remained relatively stable in recent years, with a 3%-4% share. However, it doubled in absolute terms in the last five years, going from 36 ktoe (2013) to 64 ktoe (2020). In turn, LPG consumption has increased in the last few years, but it remains marginal within the industrial sector's total consumption.

In the case of solar energy, in 2020, it was possible to estimate consumption at 0.1 ktoe, corresponding to an installed area of solar thermal collectors covering 2,437 m^2. This value was obtained from the annual surveys conducted on industrial facilities and information about the equipment imported by companies in the sector. This is a preliminary value, as solar energy information is difficult to collect in sector-specific surveys because the sample size fails to capture the population that uses this technology.

Since 2013, consumption in the industrial sector has been reported in 12 areas. Since this disaggregated information has been available, the main area in terms of energy consumption has been "pulp and paper," whose share has consistently exceeded 50% of the total industrial sector consumption. This was particularly the case in 2020 when it had a 65% share, followed by "wood," whose share was 7%, as shown in the following chart.

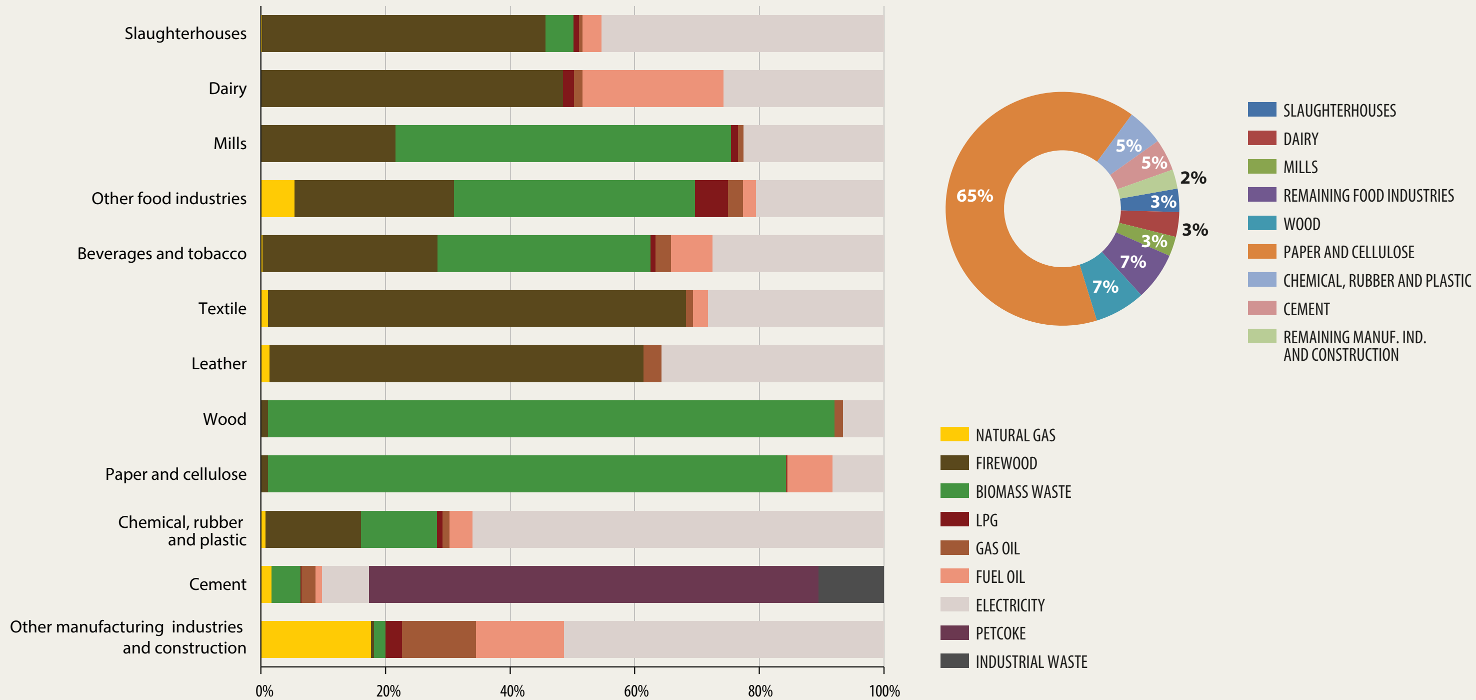
Ministerio de Industria, Energía y Minería
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

This is an analysis of the consumption patterns by source in the 12 industrial areas. As shown in the following chart, the percentage share of the various sources is independent of the area's total consumption.

It should be noted that different industrial sectors have specific consumption patterns. In 2020, both "paper and cellulose" and "wood" consumed mainly biomass waste (more than 80%) and, to a lesser extent, electricity (less than 9%). Furthermore, "chemicals, rubber, and plastic" had an electricity-based consumption in 2020 (66%), followed by firewood (15%) and biomass waste (12%), while "cement" consumed mostly petcoke (72%) and electricity (8%). In the last year, consumption in "slaughterhouses" was formed by firewood (46%), electricity (45%), biomass waste (4%), and fuel oil (3%), while "mills" mainly consumed biomass waste (54%), firewood (22%) and electricity (23%).

In the "dairy" subsector, 2020 consumption was divided into three sources: firewood (48%), fuel oil (23%), and electricity (26%). In turn, "beverages and tobacco" and "other food industries" recorded a similar consumption pattern: biomass (34% and 38% respectively), firewood (28% and 25%), and electricity (27% and 20%). In the "textile" and "leather" sectors, energy consumption was led by firewood (67% and 59%), followed by electricity (28% and 35%). Finally, the 2020 consumption of "other manufacturing industries and construction" was divided into more sources: electricity (51%), fuel oil (14%), natural gas (18%), gas oil (12%), and LPG (3%), among others.

CHART 27. Breakdown of consumption in the industrial sector, 2020.



As per the energy sources consumed and as mentioned above, biomass waste has been the source with the highest consumption in the industry sector in 2020, mainly black liquor in the cellulose industry. The highest electricity consumption was recorded in the paper and cellulose industry (35%), followed by the chemical, rubber, and plastic sector (22%) and slaughterhouses (10%). Firewood represented the third energy source consumed by the industrial sector, and the following are the main consuming sectors: dairy products (22%), slaughterhouses (20%), chemical, rubber and plastic (10%), and paper and cellulose (9%). As for fuel oil, industrial consumption was mainly divided between the paper and cellulose industry (75%), dairy (12%), and to a lesser extent, chemical, rubber, and plastic (3%).

The rest of the energy sources had a smaller share of industrial consumption. It is important to note that petcoke consumption came exclusively from the cement industry. There was no breakdown of gasoline, solar energy, or biofuels, given their small values (lower than 1 ktoe).

TABLE 15. Final energy consumption, industrial sector.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Coal	5.1	2.7	0.3	0.9											
(%)	1%	0%	0%	0%											
Natural gas				51.6	12.8	20.2	17.8	13.3	12.2	11.7	11.7	16.0	16.3	17.5	**16.3**
(%)				10%	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	**1%**
Solar									0.0	0.0	0.0	0.1	0.1	0.1	**0.1**
(%)									0%	0%	0%	0%	0%	0%	**0%**
Firewood and charcoal	35.1	80.0	150.0	139.1	181.1	216.7	200.3	207.9	196.0	176.9	176.1	176.6	190.7	180.1	**151.3**
(%)	8%	13%	32%	26%	15%	17%	16%	15%	12%	10%	9%	9%	9%	9%	**8%**
Biomass waste	15.1	35.6	46.0	41.5	638.0	618.2	619.2	683.1	893.3	1,150.0	1,219.9	1,275.4	1,250.1	1,279.8	**1,325.5**
(%)	3%	6%	10%	8%	53%	49%	50%	51%	56%	62%	62%	64%	62%	63%	**65%**
LPG	0.6	1.4	1.6	5.1	13.3	11.3	14.6	17.1	18.2	17.3	14.5	11.5	15.3	15.9	**10.3**
(%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	0%	1%	1%	**1%**
Industrial waste						2.1	1.6	4.3	3.4	6.0	7.0	6.4	8.7	8.6	**9.3**
(%)				0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Gasoline	5.6	4.7	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.3	0.5	0.5	**0.9**
(%)	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Kerosene	7.0	3.2	1.4	0.9											
(%)	2%	1%	0%	0%											
Gas oil	7.3	14.8	9.6	8.2	15.2	14.5	15.8	15.7	17.6	15.9	16.4	16.1	18.0	17.4	**16.4**
(%)	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	**1%**
Fuel oil	324.7	352.9	141.4	111.7	103.1	118.9	114.2	141.1	160.8	154.8	173.6	135.5	138.2	135.5	**129.4**
(%)	70%	59%	30%	21%	8%	9%	9%	10%	10%	8%	9%	7%	7%	7%	**6%**
Petcoke	0.0	0.0	0.8	23.7	32.5	36.1	36.1	36.0	43.9	47.0	50.8	64.8	71.1	62.9	**64.3**
(%)	0%	0%	0%	4%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	**3%**
Manufactured gas	0.6	1.0	1.4	0.0											
(%)	0%	0%	0%	0%											
Coke of coal	12.5	4.7	0.2	0.9	0.3	0.3	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1	**0.1**
(%)	3%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Electricity	49.9	93.3	112.6	146.1	217.6	217.2	213.0	226.0	249.9	279.5	303.6	302.9	318.3	311.5	**306.1**
(%)	11%	16%	24%	28%	18%	17%	17%	17%	16%	15%	15%	15%	16%	15%	**15%**
TOTAL	**463.5**	**594.3**	**465.5**	**529.9**	**1,214.2**	**1,255.8**	**1,233.0**	**1,344.9**	**1,595.6**	**1,859.5**	**1,974.0**	**2,005.7**	**2,027.4**	**2,029.9**	**2,030.0**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTES: 1) As of 2010, motor gasoline includes bioethanol. **2)** As of 2010, gas oil includes biodiesel, and until 2013, it includes diesel oil.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

4.2.5. Primary activities sector

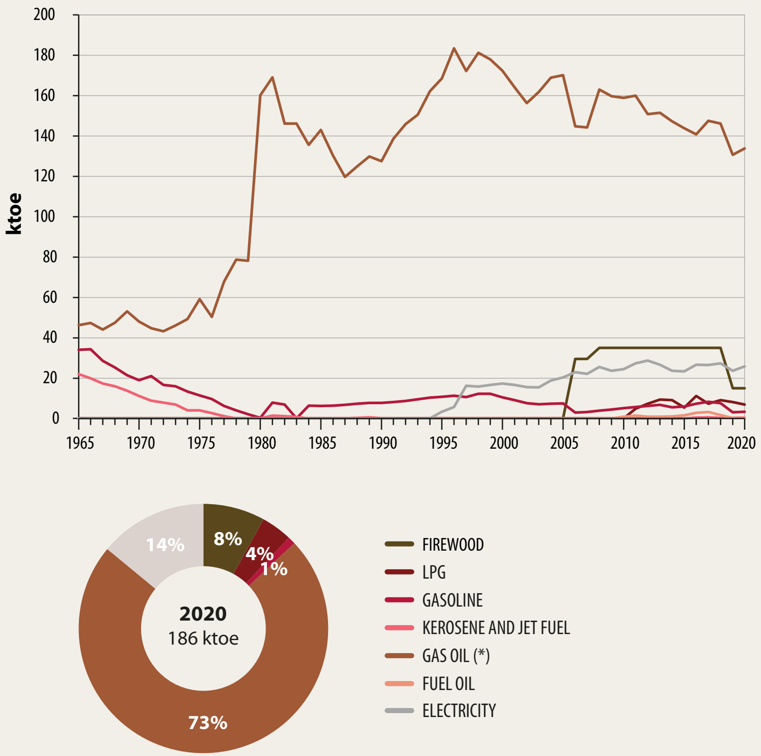
Primary activities, referred to as the agriculture/fishing/mining sector until BEN 2019, comprises the agricultural, fishing, and mining sector. This sector includes significant improvements: the agriculture/fishing/mining breakdown was implemented in 2013. The agricultural sector is disaggregated into poultry farms and other agricultural activities. This disaggregation was implemented as of 2019. These improvements were possible because new statistical operations were included.

The final energy consumption of the primary sector was 186 ktoe in 2020: 2% higher than the previous year. The most consumed source was gas oil (134 ktoe), with a 73% share. This source has had varying consumption throughout the series: its maximum amount was recorded in 1996 (186 ktoe). It must be noted that, since 2010, the gas oil reported in this sector has included blended biodiesel.

Firewood has been the second most important source in this sector. Still, as already mentioned, this BEN includes specific studies conducted in the primary sector and surveys, particularly in the poultry sector. This information shows that this subsector has replaced its energy sources in recent years. For instance, firewood has been replaced with LPG, moving firewood to third place in share percentage (8%) and electricity to second place (14%). To avoid erroneous conclusions, we must remember that the 20 ktoe drop in firewood consumption in this sector (35 ktoe in 2018 dropped to 15 ktoe in 2019) was established after a new survey. The actual fall was probably more gradual, but the survey was conducted for 2019-2020.

Furthermore, electricity consumption increased until 2012 (29 ktoe), reaching a 13% share, and decreased again to 11% in 2015 (23 ktoe). In 2020, electricity consumption grew 9% compared to the previous year, resulting in a 14% share.

CHART 28. Final energy consumption by source, primary activities sector.



LPG consumption in the primary activities sector has been recorded since 2011. In 2020, said consumption was 7 ktoe, entailing a 16% reduction compared to the previous year. Motor gasolines had a 1% share of the sector's consumption in the last year, while fuel oil reported a meager figure (<1%). There has been no record of kerosene consumption in this sector since 1993.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

The agricultural sector accounts for 84% (156 ktoe) of the consumption in the primary activities sector. Gas oil is the main source in agriculture, accounting for 70% (109 ktoe) of the sector's consumption. It is followed by electricity, which reached 15% (24 ktoe) in 2020, while firewood is in the third position, with a 10% share (15 ktoe).

The fishing sector, disaggregated as of 2013, accounts for 10% (19 ktoe) of the consumption of the primary activities sector. In the last year, a gas oil consumption of 15.4 ktoe was reported, associated with industrial fishing and 2.6 ktoe of gasoline in non-industrial fishing. Marine gas oil used in ships does not include biodiesel.

The mining sector accounts for the remaining 6% (11 ktoe) within the primary activities sector; the main energy consumed is gas oil, which accounts for 86% (9.4 ktoe) of the sector's consumption. The remaining 14% is electricity. The other sources consumed in this sector have values lower than 0.1 ktoe and do not appear in the BEN matrix.

CHART 29. Final energy consumption by sector, primary activities sector.

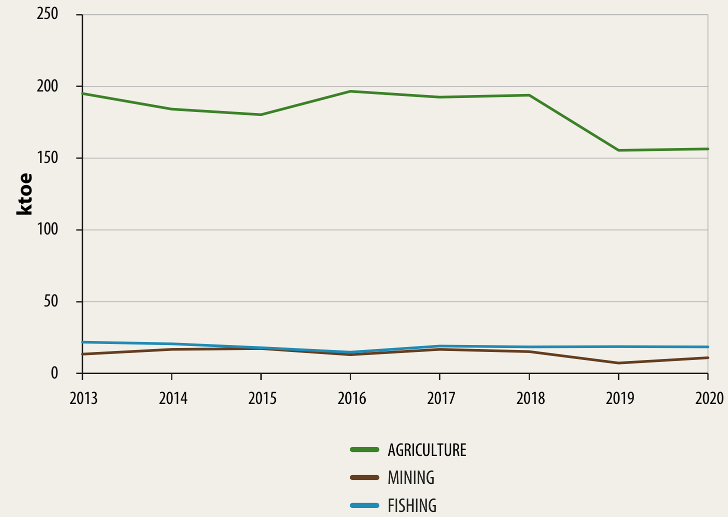
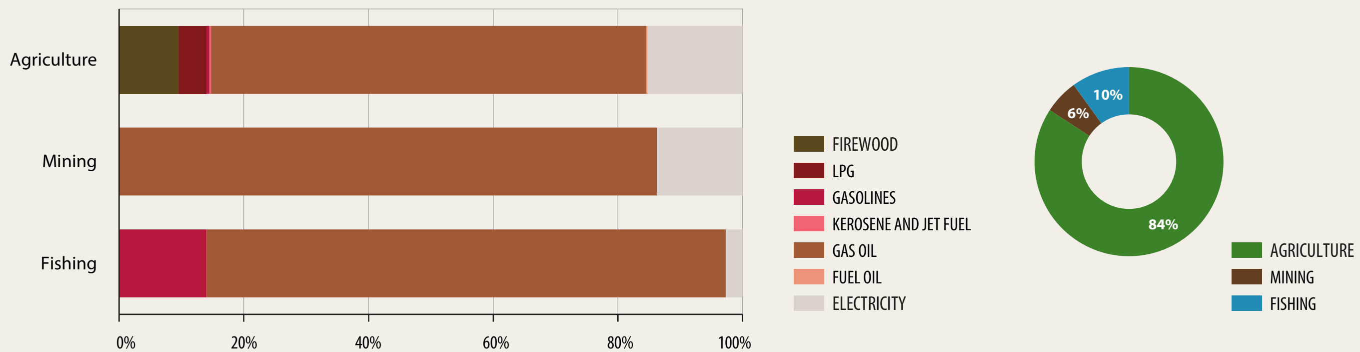


CHART 30. Breakdown of consumption in the Primary activities sector, 2020.



BEN 2020

Start
Table of Contents
Go back

Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 16. Final energy consumption, primary activities sector.

ktoe	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Firewood					35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	15.0	**15.0**
(%)					16%	15%	15%	15%	16%	16%	16%	15%	15%	8%	**8%**
LPG						4.9	7.3	9.4	9.1	5.4	11.2	7.3	9.1	8.2	**6.9**
(%)						2%	3%	4%	4%	3%	5%	3%	4%	5%	**4%**
Motor gasoline	34.0	0.3	10.7	7.4	5.2	5.7	6.3	6.8	5.5	6.0	6.2	7.3	6.8	2.3	**2.6**
(%)	33%	0%	6%	4%	2%	2%	3%	3%	2%	3%	3%	3%	3%	1%	**1%**
Aviation gasoline											1.1	1.0	0.8	0.8	**0.7**
(%)											0%	0%	0%	0%	**0%**
Kerosene and jet fuel	22.0										0.5	0.6	0.4	0.4	**0.5**
(%)	22%										0%	0%	0%	0%	**0%**
Gas oil	46.2	160.1	168.5	170.1	158.9	160.0	150.8	151.5	147.3	143.9	140.9	147.5	146.2	130.7	**133.9**
(%)	45%	100%	92%	86%	71%	68%	66%	66%	67%	67%	63%	65%	65%	73%	**73%**
Fuel oil					0.9	1.4	0.9	0.9	1.0	1.6	2.8	3.2	1.7	0.2	**0.3**
(%)					0%	1%	0%	0%	0%	1%	1%	1%	1%	0%	**0%**
Electricity			3.3	20.4	24.5	27.4	28.7	26.7	23.6	23.4	26.7	26.5	27.3	23.7	**25.9**
(%)			2%	10%	11%	12%	13%	12%	11%	11%	12%	12%	12%	13%	**14%**
TOTAL	**102.2**	**160.4**	**182.5**	**197.9**	**224.5**	**234.4**	**229.0**	**230.3**	**221.5**	**215.3**	**224.4**	**228.4**	**227.3**	**181.3**	**185.8**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

NOTES: 1) As of 2010, motor gasoline includes bioethanol. **2)** As of 2010, gas oil includes biodiesel, and until 2013, it includes diesel oil.

BEN 2020
Start
Table of Contents
Go back
1 INTRODUCTION
2 INFRASTRUCTURE OF THE URUGUAYAN ENERGY SYSTEM
3 ENERGY SUPPLY
4 ENERGY DEMAND
5 CO_2 EMISSIONS
6 INDICATORS
7 SUSTAINABLE DEVELOPMENT GOAL 7 (SDG 7)
8 METHODOLOGY
ANNEX I SUPLEMMENTARY INFORMATION
ANNEX II MATRICES AND FLOW CHARTS
Search
Print

5. CO_2 emissions

The BEN includes carbon dioxide (CO_2) emissions from fuel-burning activities in the energy industries ("power plants for public service" and "own consumption") and the final consumption sectors ("residential," "commercial/services/public sector," "transport," "industrial," "primary activities"). The series begins in 1990 when Uruguay started to have data from the National Greenhouse Gas Inventories (INGEI).

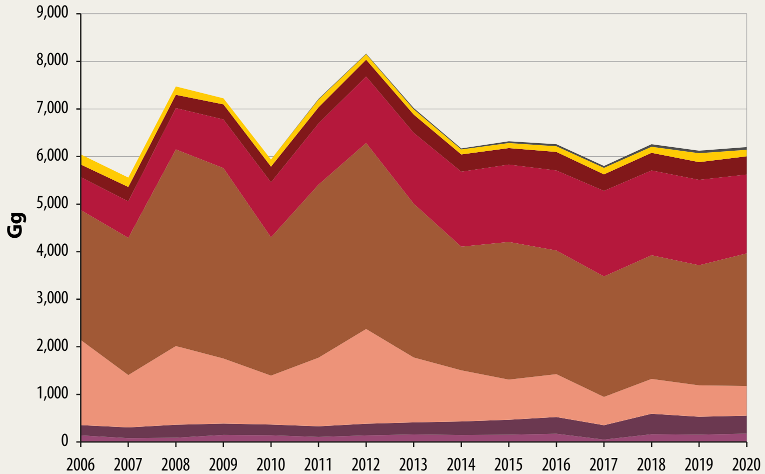
CO_2 emissions are calculated according to the "2006 IPCC Guidelines for National Greenhouse Gas Inventories". According to said methodology, CO_2 emissions from biomass fuel combustion are not considered in the totals, despite clearly being a combustion activity with energy purposes. The reason for this is that, simultaneously with these gas emissions (when biomass is burned), there is an absorption process (through photosynthesis) in plant species during their growth. It is necessary to evaluate both things simultaneously to avoid drawing misleading conclusions from partial results.

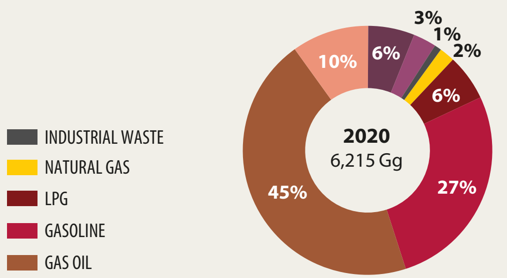
Therefore, the calculation of CO_2 emission and absorption from biomass is recorded in the "Agriculture, Forestry, and Other Land Use sector" (AFOLU) of the INGEI mentioned above. However, it is interesting to estimate CO_2 emissions from biomass combustion (firewood, biomass waste, biofuels, etc.), presented as memo items in the energy sector (without adding them up in the totals, as explained above).

Total CO_2 emissions in 2020 amounted to 6,215 Gg[9], 1% lower than in 2019. They were recorded in the following categories in decreasing order of importance: transport (3,514 Gg), industrial (858 Gg), power plants for public service (531 Gg), primary activities (426 Gg), residential (418 Gg), own consumption (395 Gg), and finally commercial/services/public sector (73 Gg).

In 2020, CO_2 emissions from fuel combustion were 6,215 Gg: 24% lower than the historical maximum in 2012.

CHART 31. CO_2 emissions by source.





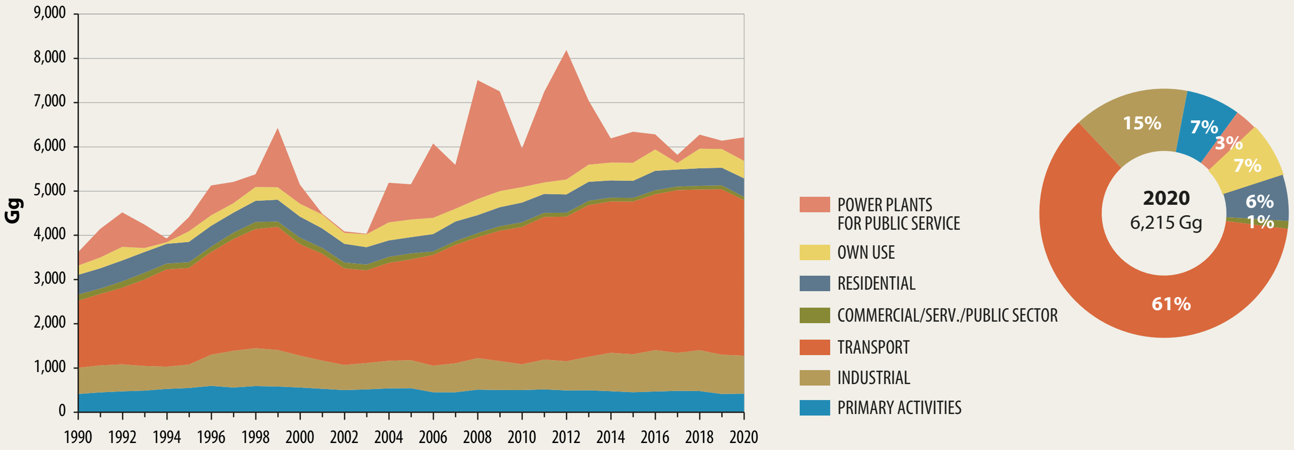
9- 1 Gg (1 billion grams) equals to 1 ktonne (one thousand tonnes).

This is how, in 2020, 15% of CO_2 emissions came from energy industries (electricity generation and own use of the energy sector), and 85% corresponded to fuel combustion activities in the different final consumption sectors.

If the whole period under study is considered, CO_2 emissions increased from 3,630 Gg in 1990 to 6,437 Gg in 1999, when they started to decrease until they reached 4,043 Gg in 2003. This drop coincides with the decrease in energy demand caused by the country's crisis at the beginning of the century and with good rainfall years. As of 2004, emissions once again reported a net upward trend until they reached the maximum levels of the period in 2012 (8,191 Gg). The following years had a net decrease in CO_2 emissions; 2020 had an emission level 24% lower than the historical maximum.

Regarding energy industries, the emissions from electricity generation power plants varied significantly as they are intricately linked to the country's rainfall conditions. For dry years with low hydroelectricity figures, the consumption of oil products in power plants is high, thus contributing to the total CO_2 emissions. In the last 15 years, the greatest records corresponded to 2008, 2009, and 2012, with 36%, 31%, and 36% in the total emissions, respectively. Similarly, in 2010 and as of 2013, there were excellent hydropower contributions for electricity generation, with the resulting lower consumption of oil products. In particular, hydroelectricity decreased between 2014 and 2018, while the significant increase in electricity from wind power and photovoltaic solar energy made it possible to counteract the situation without resorting to fossil fuel consumption. 2020 recorded one of the lowest values of hydroelectricity generation, which was similar to the 2006 figure. This led to a 52% increase in the emissions associated with the "Energy Industry." However, this increase is associated with low rainfall levels and the export of fossil fuel electricity in 2020, which has had an impact on the sector's emissions.

CHART 32. CO_2 emissions by sector.

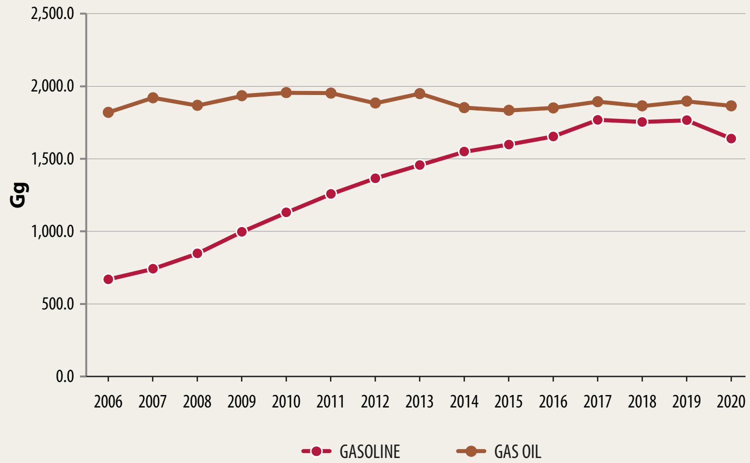


Hydrocarbon consumption (gas oil, fuel oil, and natural gas) for electricity generation decreased between 2015 and 2017; therefore, associated CO_2 emissions also dropped. In 2018, there was a 73% increase in CO_2 emissions in this category, while in 2020, there was a 155% increase compared to 2019. It is important to remember what is mentioned above regarding the export of fossil fuel electricity. It must be noted that 2017 and 2019 had the lowest CO_2 emissions from power plants of the last 15 years.

In turn, emissions from the energy sector's own use come mainly from refinery operations. These have remained relatively constant throughout the period, with shares between 5%-8% of total CO_2 emissions. In particular, in 2017, emissions decreased significantly in this category due to the refinery's maintenance shutdown, as it happened in 1994. In 2018 and 2019, normal operations resumed, and CO_2 emissions from the energy sector's own use returned to the level of previous years. In 2020 there was a new decrease, but this time as a result of lower refinery production, which, as indicated above, is explained by the actions taken by Uruguay to face the pandemic, which affected consumption in the transport sector.

The main category of CO_2 emissions in the consumption sectors has historically been the transport sector (considering the series since 1990), with an average share of 60% regarding the sector's emissions and 49% regarding total emissions. The evolution of emissions has mirrored the energy consumption trend in the sector, with a steady growth until 1999, a subsequent drop for four years, and a new net increase in emissions until and including 2019 (there was a slight reduction in 2018). In 2020, as mentioned above, there was a 6% drop in consumption, reaching values similar to those recorded in 2006. Since 2006, the increase in CO_2 emissions in the transport sector was mainly caused by emissions from gasoline consumption, with a 145% increase, while CO_2 emissions from gas oil grew only 2% when comparing 2020 to 2006. In 2006, CO_2 emissions from gasoline consumption in transport were only 27%, while this share practically halved in 2020 (47%).

CHART 33. CO_2 emissions in the transport sector.



Transport was the main category responsible for CO_2 emissions in 2020.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

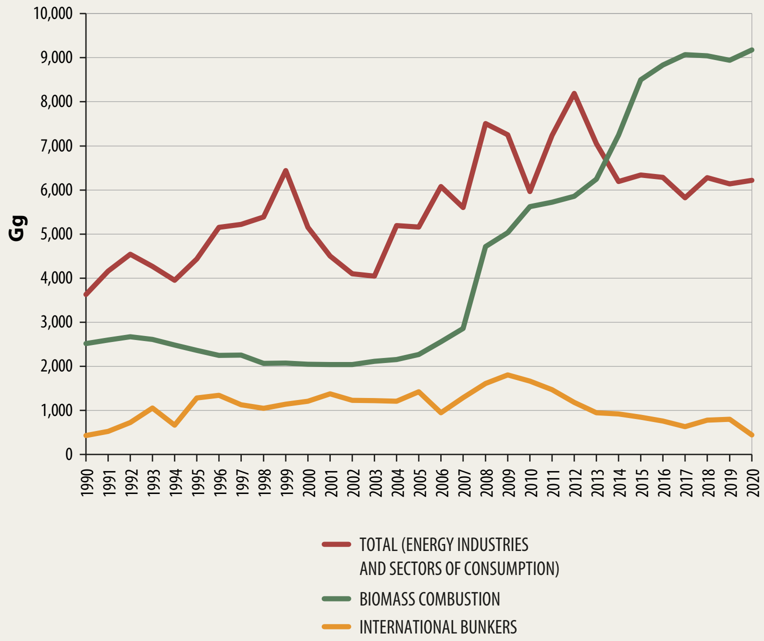
CO_2 emissions in the other consumption sectors were similar to those from the transport sector in 1990. Emission trends in these sectors grew less than in the transport sector. For this reason, its 2020 share was 29% of total CO_2 emissions, and the share was 34% within the final energy consumption sectors. Although the industrial sector has remained relatively constant throughout the period, it is essential to note that, over the last nine years, CO_2 emissions grew from 583 Gg (2010) to 858 Gg (2020). This was mainly due to increased fuel oil and petcoke consumption in the industry. CO_2 emissions from the residential, commercial/services/public sector, and primary activities sector have been low compared to the other sectors. They have remained relatively constant throughout the years.

Finally, CO_2 emissions from biomass combustion and international bunkers were included as memo items because, according to the methodology applied, they are not considered in the totals. In 2020, emissions from biomass combustion amounted to 9,178 Gg of CO_2, similar to the situation in the two previous years. As per fuels, biomass waste had the highest share (73%), followed by firewood and charcoal (24%) and, to a lesser extent, biofuels (3%).

The international bunkers category reports CO_2 emissions either from sea/river navigation or aviation, including inbound and outbound trips to other countries. In 2020, emissions from international bunkers were 443 Gg of CO_2: a 45% decrease compared to 2019. This sharp drop in bunker emissions is linked to the pandemic. This category includes consumption related to international transport, and in 2020, port and airport operations were severely affected by the pandemic.

Of these emissions, 70% came from sea and fluvial transportation through marine gas oil (60%) and fuel oil (10%), while the remaining 30% corresponded to air transportation, mainly jet fuel.

CHART 34. Memo items of CO_2 emissions.



Start
Table of Contents
Go back

Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 17. CO_2 emissions by source.

Gg	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Natural gas	212.6	197.8	175.9	127.1	149.9	166.1	118.4	111.6	105.5	107.3	120.0	137.4	128.5	188.4	**138.3**
(%)	3%	4%	2%	2%	3%	2%	1%	2%	2%	2%	2%	2%	2%	3%	**2%**
LPG	265.0	300.9	277.7	316.2	328.1	338.7	352.7	383.3	361.7	345.8	389.1	345.8	369.6	371.7	**382.0**
(%)	4%	5%	4%	4%	6%	5%	4%	5%	6%	5%	6%	6%	6%	6%	**6%**
Motor gasoline	684.7	759.3	861.7	1,014.9	1,149.0	1,278.1	1,388.3	1,480.9	1,569.4	1,619.3	1,675.6	1,792.8	1,777.1	1,790.2	**1,652.7**
(%)	11%	14%	11%	14%	19%	18%	17%	21%	25%	26%	27%	31%	28%	29%	**27%**
Aviation gasoline	6.4	7.8	7.8	7.5	7.5	7.0	8.4	8.4	7.3	7.3	6.4	6.1	5.5	5.2	**4.9**
(%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Kerosene	22.3	24.7	22.3	24.1	20.5	21.7	20.2	19.3	15.7	13.2	16.0	10.8	11.4	9.9	**9.9**
(%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Jet fuel	4.8	5.7	6.3	6.3	5.1	5.1	7.2	8.7	6.6	8.1	8.1	8.7	7.2	7.5	**7.5**
(%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0%**
Gas oil	2,731.7	2,885.2	4,132.4	4,003.1	2,907.9	3,638.8	3,910.3	3,233.0	2,598.9	2,893.6	2,599.8	2,532.8	2,599.8	2,525.1	**2,786.6**
(%)	45%	52%	55%	55%	49%	50%	48%	46%	42%	46%	42%	44%	41%	41%	**45%**
Fuel oil	1,790.1	1,100.5	1,655.3	1,368.2	1,028.9	1,443.0	1,992.0	1,365.3	1,075.6	844.5	901.5	595.6	732.7	660.1	**625.1**
(%)	29%	20%	22%	19%	17%	20%	24%	19%	17%	13%	14%	10%	12%	11%	**10%**
Petcoke	215.9	225.3	272.3	237.6	225.7	223.3	244.9	253.1	284.9	313.9	351.1	301.3	430.3	376.4	**377.2**
(%)	4%	4%	4%	3%	4%	3%	3%	4%	5%	5%	6%	5%	7%	6%	**6%**
Fuel gas	137.9	80.5	89.5	148.6	140.1	105.9	137.9	158.0	145.9	152.4	172.7	50.2	162.3	153.4	**175.1**
(%)	2%	1%	1%	2%	2%	1%	2%	2%	2%	2%	3%	1%	3%	3%	**3%**
Coal and coke of coal	9.4	11.6	6.7	0.9	1.3	1.3	0.9	0.9	0.4	0.4	0.9	0.4	0.4	0.4	**0.4**
(%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%			
Industrial waste						12.6	9.6	25.7	20.4	35.9	41.9	38.3	52.1	51.5	**55.7**
(%)						0%	0%	0%	0%	1%	1%	1%	1%	1%	**1%**
TOTAL	**6,080.8**	**5,599.4**	**7,507.8**	**7,254.4**	**5,964.0**	**7,241.5**	**8,190.8**	**7,048.1**	**6,192.1**	**6,341.9**	**6,283.1**	**5,820.3**	**6,277.0**	**6,139.8**	**6,215.5**
(%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

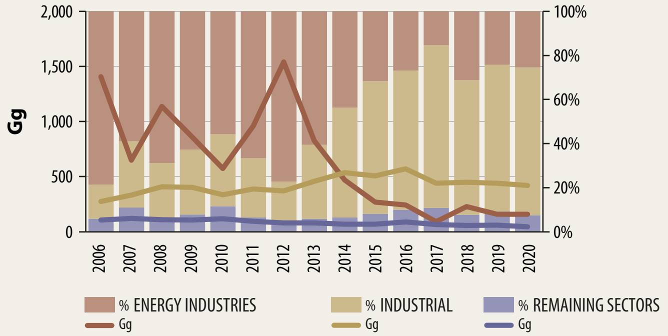
NOTES: 1) Gas oil includes diesel oil until and including 2012. **2)** Emissions from the combustion of kerosene, jet fuel, coal and coke of coal are not included because the values are small compared to the other sources.

Ministerio de Industria, Energía y Minería

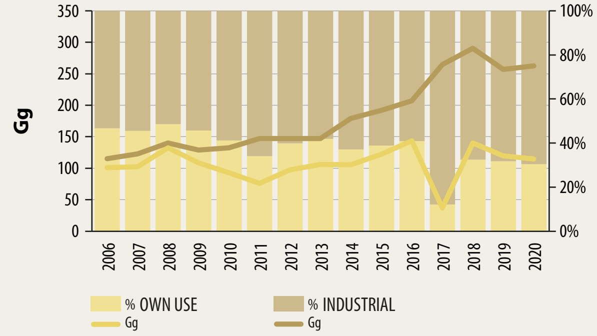
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

CHART 35. CO_2 emissions by source and sector.

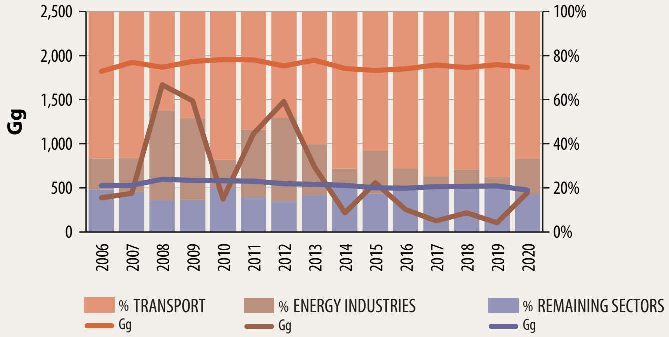
Fuel oil



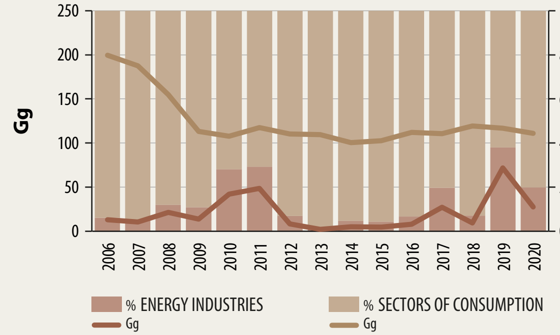
Petcoke



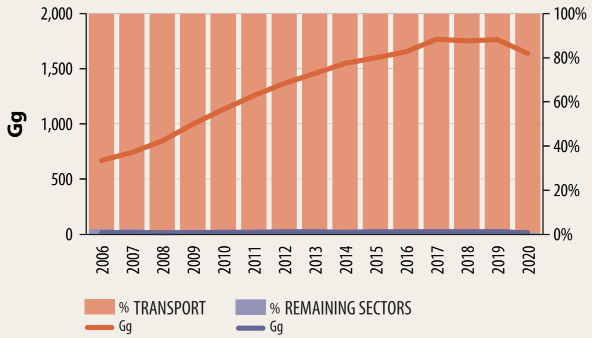
Gas oil



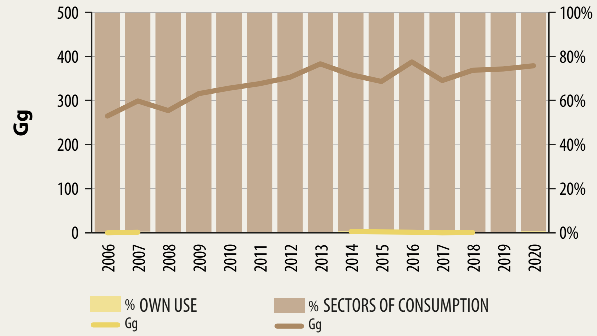
Natural Gas



Motor gasoline



LPG



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

6. Indicators

This chapter presents several indicators that relate energy and CO_2 emissions variables, among others, to economic and demographic variables. It refers to the GDP[10] and population[11] statistical series published by the Central Bank of Uruguay (BCU) and the National Statistics Institute (INE), respectively.

6.1. Final energy intensity

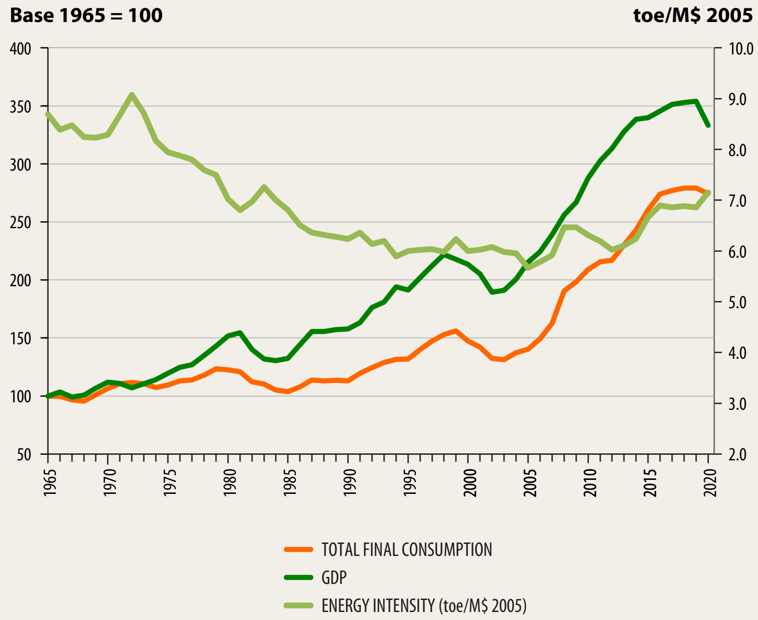
Final energy intensity is represented as the ratio between final energy consumption and GDP. It is expressed in tonnes of oil equivalent per millions of Uruguayan pesos at constant 2005 prices (toe/M$ 2005).

The final energy intensity showed a net decrease in the 1965-2020 period, reflecting considerable variability. In 1972, the historical maximum was recorded (9.1 toe/M$ 2005), and in 2005, the minimum (5.7 toe/M$ 2005). In 2020, the energy intensity group 4%, reaching 7.2 toe/M$ 2005. This growth in intensity is more related to the sharp drop in economic activity (6%) than to increased consumption, which was only 4%.

Final energy intensity in 2020: 7.2 toe/M$ 2005.

GDP and the final energy consumption individual series are analyzed to understand this indicator's evolution better. This is done by taking the values of both variables for 1965 as a base equal to 100. Both series have behaved similarly in their evolution in the 1965-2020 period, alternating years of growth and of decline where the variability recorded has made it possible to identify different periods.

CHART 36. Total final consumption and GDP (constant 2005 prices).



The years 1972 and 1983 recorded sharp increases in energy intensity compared to previous years. In the first case, final energy consumption grew while GDP decreased; in the second, both variables fell, though GDP did so at a much higher rate. Although final energy consumption and GDP recorded a net growth between 1985 and 1999, it was higher for GDP. Therefore, energy intensity fell sharply (with specific years of growth). Energy demand declined between 2000 and 2003, after which it resumed the upward trend. In turn, GDP recorded negative growth rates between and including 1999 and 2002. Therefore, both series had an upward trend until 2019. As explained above, both series decreased in 2020, but GDP fell more sharply than energy consumption, increasing energy intensity.

10- Source for 1996 and before: Bonino, Nicolás, Román, Carolina and Willebald, Henry (2012): "PIB y estructura productiva en Uruguay (1870-2011): Revisión de series históricas y discusión metodológica", Series Documento de Trabajo, 05/12, Instituto de Economía (FCEA-UdelaR) Montevideo. // Source for 1997 and later: Central Bank of Uruguay (CBU): "Serie anual a precios constantes referencia 2005", www.bcu.gub.uy (01/Jun/2020).
11- Source: National Statistics Institute (INE). Total projected population (2013 revision), www.ine.gub.uy (20/Mar/2020).

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

As of 2005, energy consumption grew at higher rates than GDP for the 2005-2009 period. In particular, final consumption in the industrial sector grew significantly in 2008 (67% compared to 2007). This changed the country's consumption structure. For these years, energy intensity increased. In 2010, 2011, and 2012, there was the opposite trend. Although energy consumption and GDP increased, final energy consumption evolved at lower rates, leading to lower energy intensity.

Meanwhile, between 2013 and 2016, final energy consumption showed increasing annual growths, mainly due to higher consumption in the industrial sector associated with a new cellulose plant. However, GDP grew at favorable but lower rates year by year and reflected increasing energy intensity. In 2017 and 2018, the behavior was similar to that of the 2010-2012 period, with increases in final consumption and GDP, but at higher rates for the latter and downward energy intensity. For 2019, both variables grew at rates lower than 1% and resulted in an energy intensity 0.6% higher than in 2018. This behavior is typical of economic slowdowns in a pivotal year, which does not imply structural changes.

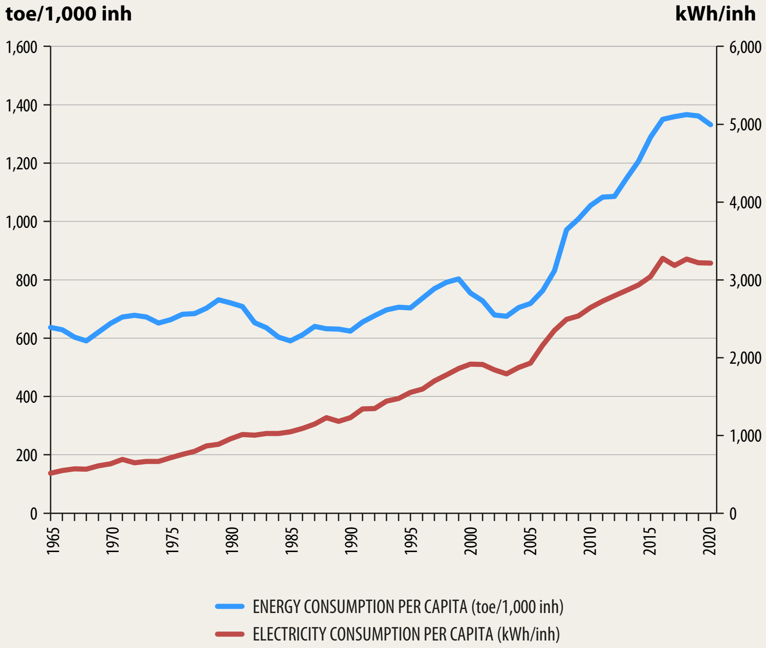
6.2. Energy and electricity consumption per capita

Energy consumption per capita is obtained as the ratio between total final energy consumption and the number of inhabitants, expressed in tonnes of equivalent oil per 1,000 inhabitants (toe/1,000 inh). This indicator has recorded a net growth throughout the period under study, rising from 637 toe/1,000 inh (1965) to 1,332 toe/1,000 inh (2020). The historical minimum was recorded in 1968 and 1985 (591 toe/1,000 inhabitants) and the maximum in 2018.

After the 1968 minimum, energy consumption per capita increased for eleven years, reaching a relative high in 1979, followed by six years of decline. From 1986, energy consumption per capita grew steadily; this growth was interrupted by the economic crisis at the turn of the century. However, this changed in 2004, when the upward trend began. In 2007, the consumption peak of 1999 (pre-crisis) was surpassed, and energy consumption per capita kept growing until 2018. Consumption per capita has decreased in the last two years.

In turn, **electricity consumption per capita** is obtained as the ratio between electricity consumed and the number of inhabitants and expressed in kilowatt-hour per inhabitant (kWh/inh). Throughout the whole period, electricity consumption per capita had, in general, an upward trend, except for specific years where it decreased. The economic crisis affected electricity consumption per capita, as well as the remaining indicators.

CHART 37. Energy and electricity consumption per capita.



Start
Table of Contents
Go back

Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Electricity consumption per capita increased from 512 kWh/inh (1965) to a maximum of 1,917 kWh/inh (2000), and then it dropped to a minimum of 1,788 kWh/inh. (2003). From that year onwards, the trend was reversed again, and the indicator began to grow. In 2017 and 2019, there were decreases of 3% and 2%, and 2020 (3,213 kWh/inhabitant) recorded a value practically equal to that of 2019 (3,218 kWh/inh). While in 2018, it reached an all-time high consumption of 3,275 kWh/inh.

2020:
Final consumption per capita:
1,332 toe/1,000 inh.
Electricity consumption per capita:
3,213 kWh/inh.

TABLE 18. Total final consumption and GDP.

	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total final consumption (ktoe)	1,715	2,101	2,263	2,408	3,584	3,696	3,722	3,948	4,166	4,467	4,699	4,749	4,790	4,791	**4,702**
GDP (M$ 2005) *	197,252	299,301	377,320	425,018	567,742	597,050	618,174	646,842	667,792	670,268	681,594	692,689	695,999	698,438	**657,519**
GDP (M$ 2016) **							1,548,643	1,629,835	1,698,400	1,698,986	1,726,406	1,754,508	1,762,893	1,769,071	**1,665,426**
Total final consumption/GDP (toe/M$ 2005)	**8.7**	**7.0**	**6.0**	**5.7**	**6.3**	**6.2**	**6.0**	**6.1**	**6.2**	**6.7**	**6.9**	**6.9**	**6.9**	**6.9**	**7.2**
Total final consumption/GDP (toe/M$ 2016)							**2.4**	**2.4**	**2.5**	**2.6**	**2.7**	**2.7**	**2.7**	**2.7**	**2.8**

NOTES: 1) (*) Source: Years 1965-1996: Bonino, Nicolás; Román, Carolina; and Willebald, Henry (2012): "GDP and productive structure in Uruguay (1870-2011): Review of historical series and methodological discussion", Working Document Series , 05/12, Institute of Economics (FCEA-UdelaR) Montevideo. Years 1997-2016: Central Bank of Uruguay (BCU): "Annual series, constant prices 2005 reference by splice"; www.bcu.gub.uy (07/01/2021). Years 2017-2020: Own elaboration MIEM-DNE based on data from the (BCU). M$ 2005 corresponds to millions of pesos at constant 2005 prices. **2)** Source: Years 2012-2015: Álvez, M., Bucacos, E., Mateauda, M & Pienika, E. (2021): "Retropolation for series of Quarterly National Accounts. Series of Gross Domestic Product of Uruguay with quarterly frequency for the period 2012-2015". Working document, 002-2021. Central Bank of Uruguay. (**) Years 2016-2020: Central Bank of Uruguay (BCU): "GDP series by expenditure components in millions of constant 2016 pesos". www.bcu.gub.uy (01/07/2021). M$ 2016 corresponds to millions of pesos at constant 2016 prices.

TABLE 19. Energy and electricity consumption per capita. ▸**DOWNLOAD spreadsheet 01** ▸**DOWNLOAD spreadsheet 02**

	1965	1980	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population (thousands of inhabitants) *	2,693	2,914	3,218	3,352	3,397	3,413	3,426	3,440	3,454	3,467	3,480	3,493	3,506	3,519	**3,531**
Total final consumption (ktoe)	1,715	2,101	2,263	2,408	3,584	3,696	3,722	3,948	4,166	4,467	4,699	4,749	4,790	4,791	**4,702**
Consumption per capita (toe/1.000 inh)	**637**	**721**	**703**	**718**	**1,055**	**1,083**	**1,086**	**1,148**	**1,206**	**1,289**	**1,350**	**1,360**	**1,366**	**1,362**	**1,332**
Final electricity consumption (ktoe)	118.5	239.0	429.8	556.7	772.7	800.3	823.8	847.2	871.3	906.2	980.5	956.1	985.2	973.7	**975.8**
Electricity consumption per capita (toe/1.000 inh)	44	82	134	166	227	235	240	246	252	261	282	274	281	277	**276**
Electricity consumption per capita (kWh/inh)	**512**	**954**	**1,553**	**1,931**	**2,645**	**2,727**	**2,796**	**2,864**	**2,933**	**3,039**	**3,276**	**3,183**	**3,268**	**3,218**	**3,213**

NOTES: 1) (*) Source: National Statistics Institute (INE). Total projected population (revision 2013). **2)** The total population recorded according to the 2011 census was 3,286,314 inhabitants. This value is not used in the serial record in order not to create gaps.

Ministerio de Industria, Energía y Minería

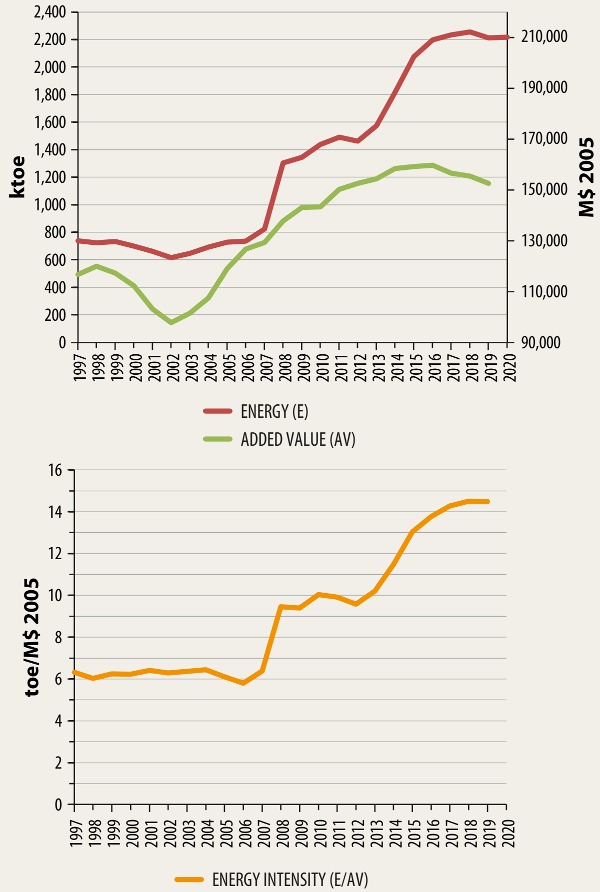
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

6.3. Energy intensity by sector

Energy intensity by sector is represented as the ratio between a sector's energy consumption and its added value[12]. It is expressed in tonnes of oil equivalent per millions of Uruguayan pesos at constant 2005 prices (toe/M$ 2005). This represents the amount of energy required to generate a unit of added value. If instead of analyzing the energy consumption globally compared to GDP, it is analyzed by sector concerning the added value of that sector, different patterns are observed depending on the sector. The following is the analysis of energy intensities for three sectors considering the 1997-2019 period. The series did not include 2020, given the change of base implemented by the BCU (2016 base). This new base has very few years and did not allow for sector-specific disaggregation at the time of this publication.

The series **industrial/primary activities** sector clearly shows the impact of the new cellulose industries in the market. This also caused a surge in the energy intensity in 2008 and 2014. Until 2007, sectoral energy intensity remained between 5.8 and 6.4 toe/M$ 2005 and grew 48% in 2008. From that year, energy intensity has reported an upward trend, except in 2009, 2011, and 2012, which reported a slight reduction associated with the slower energy consumption growth in the industrial sector compared to economic growth. The year 2012 was an exception, as energy consumption decreased compared to the previous year. Between 2013 and 2016, both energy consumption and added value increased, reflecting the recovery of energy intensity. In the last three years, the significant growth in energy consumption has slowed down. Although the sector's added value decreased, the energy intensity of the industrial/primary activities sector increased.

CHART 38. Energy intensity of the industrial/primary activities sector.



NOTE: without 2020 data, BCU did not publish the information to build this indicator.

12- Prepared by DNE-MIEM from data produced by the Central Bank of Uruguay (CBU): "Producto Interno Bruto por Industrias, Serie anual, precios constantes referencia 2005 por empalme," www.bcu.gub.uy (01/Jun/2021).

Ministerio de Industria, Energía y Minería

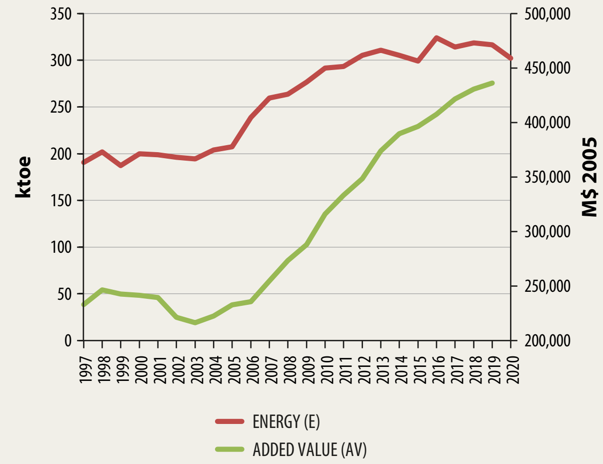
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

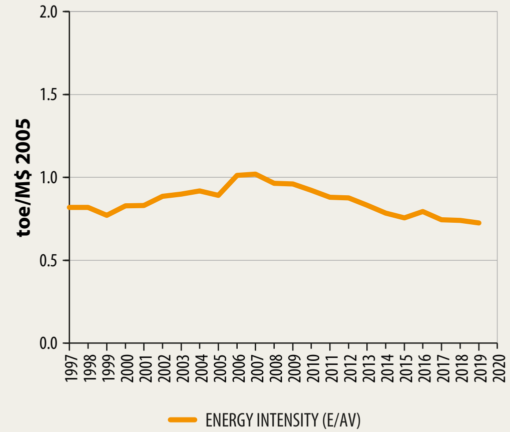
Finally, the series did not vary significantly regarding energy intensity in the **commercial/services/public** sector and remained relatively constant in the period studied (1997-2019), with a net decrease. The maximum value was reached in 2007 (1 toe/M$ 2005), and since 2008, there has been a downward trend, although both energy consumption and added value of the sector increased in said years. This explains why the sector's energy consumption has had a lower growth rate than the added value, which could result from implementing energy efficiency measures in the sector. The last five years have reported the lowest historical energy intensity values in the commercial/services/public sector (0.70 toe/M$ 2005 in 2019).

In turn, the energy intensity of the **transport** sector is analyzed in two different ways, using, on the one hand, the sector's added value and, on the other, the global GDP. The latter approach is essential as transport is a cross-cutting sector in the economy.

The energy intensity of transport per unit of added value in this sector reached its historic lows in 2000 and 2008 (33.5 toe/M$ 2005) and varied over most of the period under review, with positive and negative growth rates. The growth (8%) recorded in energy intensity between 2008 and 2009 may have been caused by the international crisis because the added value generated in transport was barely higher than the previous year, while energy consumption maintained a historical growth. The years 2015 and 2016 were relevant because the increase in energy consumption and the decrease in added value resulted in 14% and 11% growths in the energy intensity of the transport sector. In 2018 and 2019, energy intensity grew again (2%) after the fall recorded in 2017 (2%).

CHART 39. Energy intensity of the commercial/services/public sector.





NOTE: without 2020 data, BCU did not publish the information to build this indicator.

Start
Table of Contents
Go back

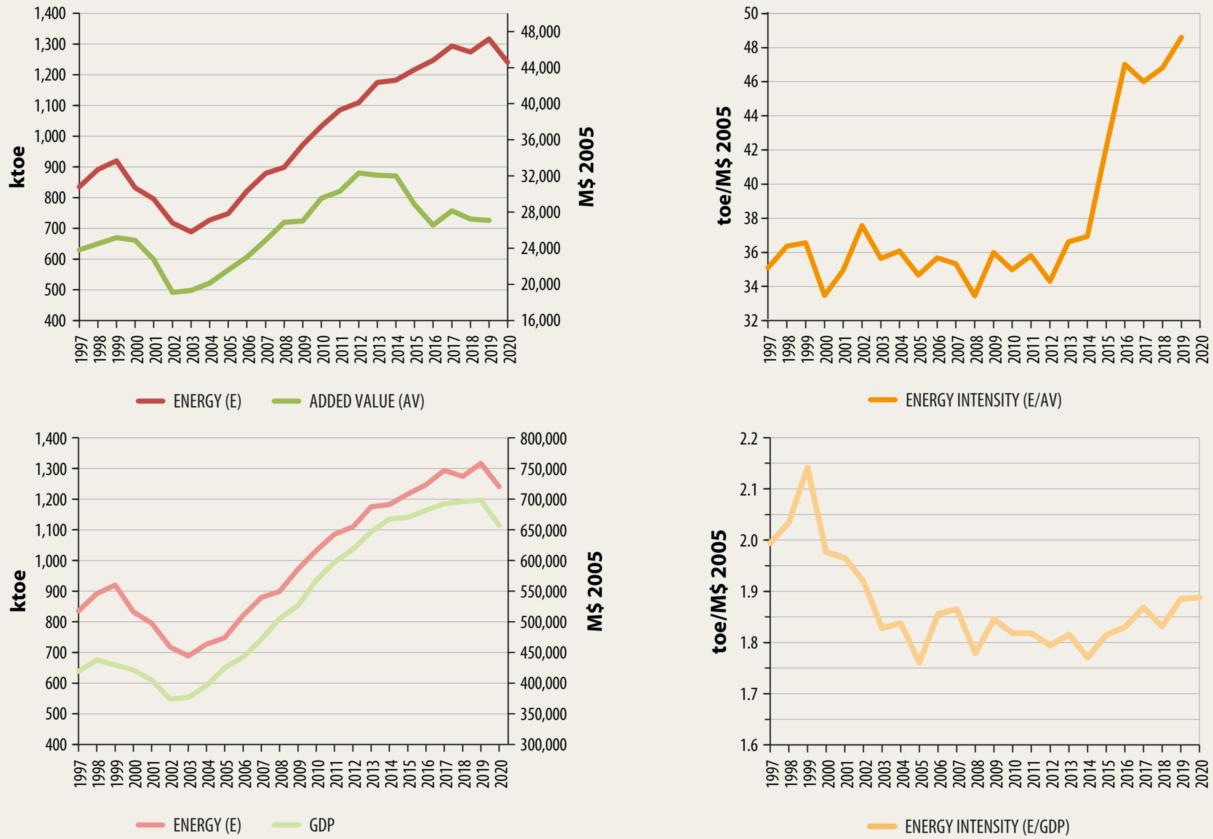
Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Finally, the energy intensity of transport per GDP unit behaved quite differently from the previous analysis, both in its trend and in the magnitude of values. Energy consumption in the transport sector and GDP developed similarly between 1997 and 2019, in terms of net growth over the whole period, with a sharp decline at the turn of the century caused by the crisis. Energy intensity peaked in 1999 (2.1 toe/M$ 2005), followed by a decrease until 2005 (1.8 toe/M$ 2005), as energy consumption declined at rates higher than GDP. From that year until 2020, energy intensity alternated annual increases and falls, a behavior that remained at values between 1.8 and 1.9 toe/M$ 2005.

CHART 40. Energy intensity of the transport sector.



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 20. Energy intensity by sector.

		1997	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Industrial-primary activities	E	737.3	700.0	727.8	1,438.7	1,490.2	1,462.0	1,575.2	1,817.1	2,074.8	2,198.4	2,234.1	2,254.7	2,211.2	**2,215.8**
	AV*	116,714	112,268	119,057	143,386	150,267	152,530	154,319	158,327	159,176	159,721	156,513	155,426	152,540	**N/D**
	I	**6.32**	**6.24**	**6.11**	**10.03**	**9.92**	**9.58**	**10.21**	**11.48**	**13.03**	**13.76**	**14.27**	**14.51**	**14.50**	**N/D**
Commercial-services-public sector	E	190.8	200.0	207.4	291.6	293.4	305.4	310.8	305.4	299.2	323.9	314.0	318.7	316.4	**302.2**
	AV	232,969	241,637	232,787	316,082	333,314	348,525	373,860	389,676	396,366	407,551	421,556	430,757	436,366	**N/D**
	I	**0.82**	**0.83**	**0.89**	**0.92**	**0.88**	**0.88**	**0.83**	**0.78**	**0.75**	**0.79**	**0.74**	**0.74**	**0.73**	**N/D**
Transport	E	835.5	832.3	748.2	1,032.3	1,085.7	1,109.3	1,174.7	1,182.3	1,216.4	1,247.4	1,294.2	1,274.4	1,316.9	**1,240.9**
	AV	23,811	24,866	21,576	29,509	30,318	32,337	32,085	32,019	28,853	26,533	28,132	27,217	27,092	**N/D**
	I	**35.09**	**33.47**	**34.68**	**34.98**	**35.81**	**34.30**	**36.61**	**36.92**	**42.16**	**47.01**	**46.00**	**46.82**	**48.61**	**N/D**
	GDP(2)	419,003	421,157	425,018	567,742	597,050	618,174	646,842	667,792	670,268	681,594	692,689	695,999	698,438	**657,519**
	I	**1.99**	**1.98**	**1.76**	**1.82**	**1.82**	**1.79**	**1.82**	**1.77**	**1.81**	**1.83**	**1.87**	**1.83**	**1.89**	**1.89**
	GDP(3)						1,548,643	1,629,835	1,698,400	1,698,986	1,726,406	1,754,508	1,762,893	1,769,071	**1,665,426**
	I						**0.72**	**0.72**	**0.70**	**0.72**	**0.72**	**0.74**	**0.72**	**0.74**	**0.75**

NOTES: 1) Own elaboration MIEM-DNE based on data from the Central Bank of Uruguay (BCU): “Gross Domestic Product by Industries, Annual series, constant prices 2005 reference per joint”; www.bcu.gub.uy (07/01/2021). “M$ 2005” corresponds to millions of pesos at constant 2005 prices. **2)** Source: Central Bank of Uruguay (BCU): “Gross Domestic Product by Industries, Annual series, constant prices 2005 reference by splice”; www.bcu.gub.uy (07/01/2021). “M$ 2005” corresponds to millions of pesos at constant 2005 prices. Years 2017 to 2020: Own MIEM-DNE based on data from the BCU. **3)** Source: Central Bank of Uruguay (BCU): Years 2012-2015: Álvez, M., Bucacos, E., Mateauda, M & Pienika, E. (2021): “Retropolation for series of Quarterly National Accounts. Series of Gross Domestic Product of Uruguay with quarterly frequency for the period 2012-2015. Working document, 002-2021. Years 2016-2020: “GDP series by expenditure components in millions of constant 2016 pesos”. www.bcu.gub.uy (07/01/2021). M$ 2016 corresponds to millions of pesos at constant 2016 prices. **4)** The energy intensity is calculated as the energy consumed (in toe) divided by the added value of the sector (in M $ 2005). For the transport sector, three energy intensities are presented, one based on the added value of the sector and another two based on global GDP (at constant 2005 and 2016 prices). **5)** N/D: no data. BCU did not publish the information to build this indicator.

Ministerio de Industria, Energía y Minería

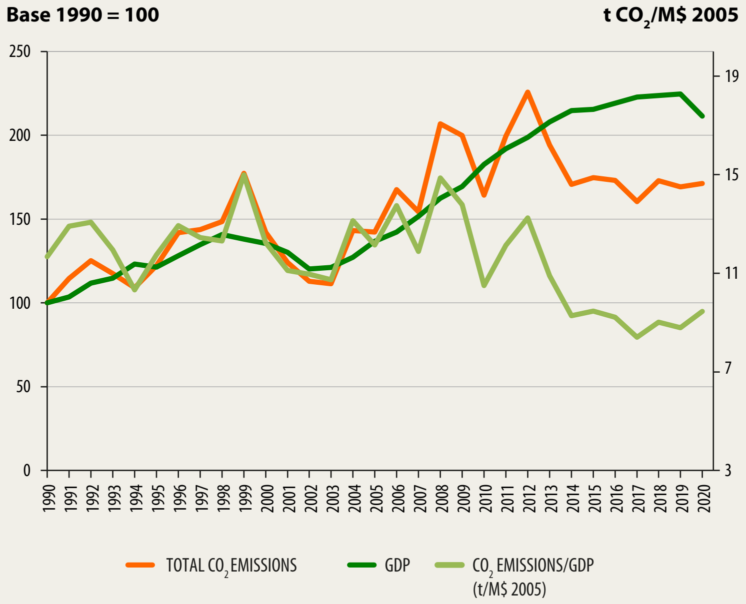
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

6.4. CO_2 emissions per GDP and per capita

CO_2 emission intensity is defined as the ratio between CO_2 emissions and the GDP. It is expressed in tonnes of CO_2 per million of Uruguayan pesos at constant 2005 prices (tCO_2/M$ 2005). In the 1990-2020 period, this indicator showed a net decrease from 12 to 10 tCO_2/M$ 2005 and recorded variability throughout the series. The years with the highest intensity levels in emissions were 1999 and 2008 (15 tCO_2/M$ 2005), while the lowest records since 1997 were reported in the last seven years (8-10 tCO_2/M$ 2005).

The individual series of GDP and CO_2 emissions from fuel combustion are analyzed to understand this indicator's evolution better. This is done by taking the values of both variables for 1990 as a base equal to 100.

CHART 41. Total CO_2 emissions and GDP (at constant 2005 prices).



Although CO_2 emissions have presented some variability throughout the series, they have accompanied GDP evolution. This behavior is also reflected in the intensity of CO_2 emissions. Significant fluctuations in the total CO_2 emissions were strongly associated with the variation of emissions from thermal power plants for electricity generation due to the consumption of oil products for electricity generation to complement hydroelectricity. Similar to 2006, 2008, and 2012, in 2020, there was poor availability of hydropower, resulting in higher CO_2 emissions compared to other years with better flow rates and their corresponding lower consumption of oil products for energy generation.

It is important to note the last six years, which recorded a significant increase in wind and photovoltaic electricity that offset the decrease in hydroelectricity. This resulted in lower consumption of oil products and the resulting decline in CO_2 emissions for electricity generation. The increase in wind energy for electricity generation moderated the impact on emissions in a dry year such as 2020. Additionally, GDP dropped significantly, so that the intensity of emissions per GDP unit increased in the last year, reaching 9 tCO_2/M$2005.

2020:
CO_2 emission intensity: 9 tCO_2/M$ 2005
CO_2 emissions per capita: 1.8 tCO_2/inh.

Meanwhile, **CO_2 emissions per capita** are represented as the ratio between total CO_2 emissions and population and are expressed in tonnes of CO_2 per inhabitant (tCO_2/inh). Net growth was recorded for the 1990-2020 period, which showed significant variability. This behavior, which alternates maximum and minimum records, is correlated with a variation in fossil fuel consumption in thermal power plants.

Ministerio de Industria, Energía y Minería

BEN
BALANCE ENERGÉTICO NACIONAL URUGUAY

The minimum CO_2 emissions per capita were recorded in 1990 (1.2 tCO_2/inh), while in 2012, emissions reached their maximum levels (2.4 tCO_2/inh). Over the last seven years, CO_2 emissions per capita remained relatively constant (1.7-1.8 tCO_2/inh).

CHART 42. CO_2 emissions per capita.

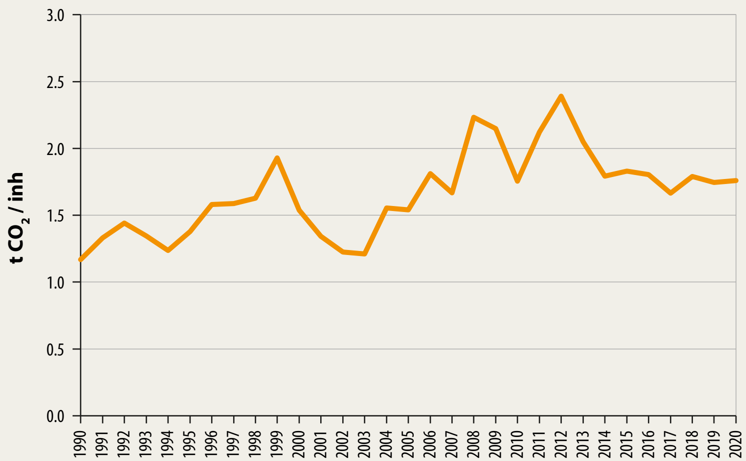


TABLE 21. CO_2 emissions by GDP and per capita.

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total CO_2 emissions (Gg)	3,630	4,434	5,155	5,160	5,964	7,242	8,191	7,048	6,192	6,342	6,283	5,820	6,277	6,140	**6,215**
GDP (M$ 2005) (1)	311,082	377,320	421,157	425,018	567,742	597,050	618,174	646,842	667,792	670,268	681,594	692,689	695,999	698,438	**657,519**
GDP (M$ 2016) (1)							1,548,643	1,629,835	1,698,400	1,698,986	1,726,406	1,754,508	1,762,893	1,769,071	**1,665,426**
CO_2 emissions/GDP (t/M$ 2005)	**11.7**	**11.8**	**12.2**	**12.1**	**10.5**	**12.1**	**13.2**	**10.9**	**9.3**	**9.5**	**9.2**	**8.4**	**9.0**	**8.8**	**9.5**
CO_2 emissions/GDP (t/M$ 2016)							**5.3**	**4.3**	**3.6**	**3.7**	**3.6**	**3.3**	**3.6**	**3.5**	**3.7**
Population (thousands of inhabitants) (2)	3,106	3,218	3,349.2	3,352.4	3,396.7	3,412.6	3,426.5	3,440.2	3,453.7	3,467.1	3,480.2	3,493.2	3,506.0	3,518.6	**3,530.9**
CO_2 emissions per cápita (t/inh)	**1.2**	**1.4**	**1.5**	**1.5**	**1.8**	**2.1**	**2.4**	**2.0**	**1.8**	**1.8**	**1.8**	**1.7**	**1.8**	**1.7**	**1.8**

NOTES: 1) Source: Years 1990-1996: Bonino, Nicolás; Roman, Carolina; and Willebald, Henry (2012): "GDP and productive structure in Uruguay (1870-2011): Review of historical series and methodological discussion", Working Document Series, 12/05, Institute of Economics (FCEA-UdelaR) Montevideo. Years 1997-2016: Central Bank of Uruguay (BCU): "Annual series at constant prices reference 2005". www.bcu.gub.uy (07/01/2021). Years 2017-2020: Own elaboration MIEM-DNE based on data from the BCU. M$ 2005 corresponds to millions of pesos at constant 2005 prices. **2)** Source: Central Bank of Uruguay (BCU): Years 2012-2015: Álvez, M., Bucacos, E., Mateauda, M & Pienika, E. (2021): "Retropolation for series of Quarterly National Accounts. Series of Uruguay's Gross Domestic Product with quarterly frequency for the period 2012-2015 ". Working document, 002-2021. Years 2016-2020: "GDP series by expenditure components in millions of constant 2016 pesos". www.bcu.gub.uy (07/01/2021). M$ 2016 corresponds to millions of pesos at constant 2016 prices. **3)** Sources: National Statistics Institute (INE). Total projected population (revision 2013). www.ine.gub.uy (01/07/2021). The total population recorded according to the 2011 census was 3,286,314 inhabitants. This value is not used in the serial record in order not to create gaps.

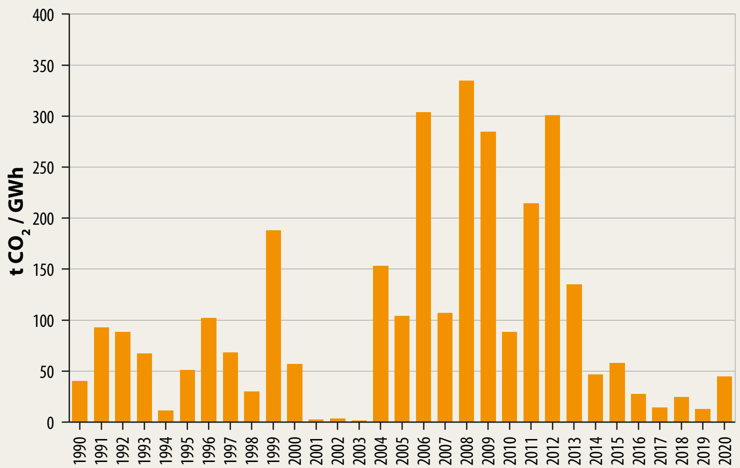
Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

6.5. The CO_2 emission factor of the SIN

The **emission factor of the SIN** represents the amount of CO_2 generated per GWh of electricity produced for the electricity grid. It is determined as the ratio of CO_2 emissions from power plants for public service and the electricity generated by said generators and delivered to the SIN. The emission factor varies from one year to another according to the blend of fuels used for electricity generation delivered to the grid.

CHART 43. CO_2 emission factor of the SIN.



The emission factor has presented considerable variability throughout the whole series. This effect is associated with the considerable influence of rainfall levels on electricity generation in the country and the resulting amount of fossil fuels used, as mentioned above. In recent years, the generation of electricity from renewable sources has increased significantly, particularly wind energy and, to a lesser extent, photovoltaic solar energy. This seems to indicate that these sources and hydroelectricity have reduced the use of fossil fuels for such purposes.

The maximum emission factor at the SIN was reported in 2008, with a 335 tCO2/GWh value, followed in importance by 2006 (304 tCO_2/GWh) and 2012 (301 tCO_2/GWh). The minimum figures were recorded between 2001 and 2003, with values lower than 3 tCO_2/GWh when almost 100% of the electricity was hydroelectricity. In 2020, a dry year (similar to 2006), where hydroelectricity accounted for only 30% of total generation, the emission factor of the SIN was 45 tCO_2/GWh.

2020 SIN emission factor: 45 tCO_2/GWh.

TABLE 22. CO_2 emission factor of the SIN.

	1990	1995	2000	2005	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
CO_2 emissions from power plants for public service (Gg CO_2)	298.8	318.2	429.4	795.3	872.6	2,044.7	2,926.5	1,449.1	544.8	700.3	340.8	183.3	316.7	187.1	**531.1**
Electricity generated and supplied to the national grid (GWh)	7,358	6,236	7,547	7,641	9,903	9,535	9,729	10,729	11,728	12,128	12,274	12,726	12,876	14,406	**11,833**
Emission factor of the SIN (t CO_2/GWh)	**41**	**51**	**57**	**104**	**88**	**214**	**301**	**135**	**46**	**58**	**28**	**14**	**25**	**13**	**45**

NOTES: 1) CO_2 emissions are calculated according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. **2)** SIN: National Interconnected System.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

6.6. Electrification rate

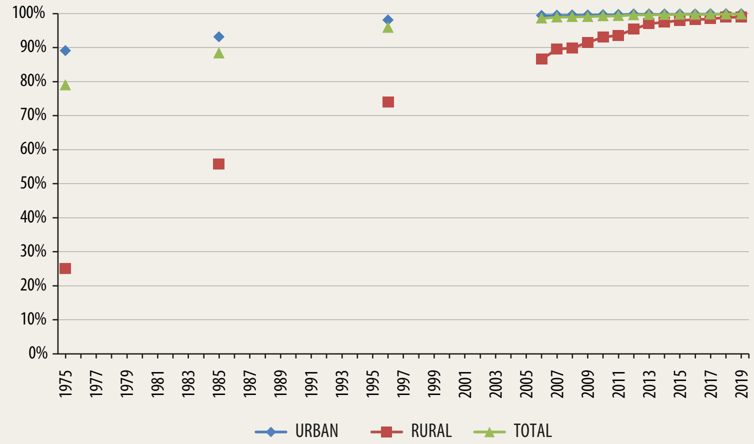
The **electrification rate** expresses the percentage of households with electricity compared to the total number of homes with dwellers. This indicator is developed for urban areas, rural areas, and the country total.

The total electrification rate went from 79.0% to 99.8% between 1975 and 2017 and remained constant until 2019. When analyzing the indicator separated by urban and rural areas, the most remarkable evolution is observed in the rural electrification rate, which has increased from 25.1% in 1975 to 98.9% in 2019. The urban electrification rate went from 89.0% to 99.9% in this period. This value could not be updated to 2020, as the continuous household survey—the statistical operator used to calculate this indicator—was not conducted because of the pandemic.

The total electrification rate went from 79.0% to 99.8% between 1975 and 2017 and remained constant until 2019.

That is to say, of the total number of occupied households in 2019, only 0.2% did not have electricity, either provided by UTE or its own (generator and/or battery charger via wind or solar generator), corresponding to 2,310 homes. The distribution was 1,599 housing units in the urban environment (0.1%) and 711 in rural areas (1.1%).

CHART 44. Electrification rate.



NOTE: no data. INE does not release information in the ECH 2020..

TABLE 23. Electrification rate.

U: Urban / R: Rural / T: Total		1975	1985	1996	2006	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Occupied households (thousands)	U	632.4	719.0	855.2	1,050.2	1,098.6	1,100.6	1,099.2	1,121.7	1,149.3	1,155.3	1,161.6	1,166.6	1,173.0	1,175.0	N/D
	R	117.5	104.1	83.6	67.7	56.2	56.1	56.3	61.5	63.4	63.8	64.1	64.5	63.8	64.8	N/D
	T	**749.9**	**823.1**	**938.8**	**1,117.9**	**1,154.8**	**1,156.7**	**1,155.5**	**1,183.2**	**1,212.7**	**1,219.1**	**1,225.7**	**1,231.1**	**1,236.9**	**1,239.8**	**N/D**
Occupied households with electricity (thousands)	U	562.9	669.2	838.1	1,043.3	1,093.9	1,096.4	1,096.8	1,118.9	1,146.7	1,153.1	1,159.4	1,164.8	1,171.0	1,173.4	N/D
	R	29.5	58.0	61.9	58.6	52.3	52.5	53.7	59.7	61.8	62.5	62.9	63.5	63.1	64.0	N/D
	T	**592.4**	**727.2**	**900.0**	**1,101.9**	**1,146.2**	**1,148.9**	**1,150.5**	**1,178.6**	**1,208.5**	**1,215.5**	**1,222.3**	**1,228.3**	**1,234.1**	**1,237.5**	**N/D**
Electrification rate (%)	U	89.0%	93.1%	98.0%	99.3%	99.6%	99.6%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.9%	N/D
	R	25.1%	55.7%	74.0%	86.6%	93.1%	93.6%	95.4%	97.0%	97.5%	97.9%	98.2%	98.4%	98.9%	98.9%	N/D
	T	**79.0%**	**88.3%**	**95.9%**	**98.6%**	**99.3%**	**99.3%**	**99.6%**	**99.6%**	**99.7%**	**99.7%**	**99.7%**	**99.8%**	**99.8%**	**99.8%**	**N/D**

NOTES: 1) The information for 1975, 1985, 1996 and 2011 is taken from the national population and housing censuses. For the rest of the years, the information comes from the continuous household surveys. (Source: INE and DNE's own estimates). **2)** The data for 1975 correspond only to UTE's electrification rate. **3)** From 1975 to 1996, these are housing units with dwellers present. **4)** From 2006 onwards, own generators and battery chargers (solar, wind) are included. **5)** N/D: no data. INE does not release information in the ECH 2020.

6.7. Energy path

The **energy path** is a graphic representation of two indicators: final energy intensity and GDP per capita. The energy intensity is expressed in tonnes of oil equivalent per millions of Uruguayan pesos at constant 2005 prices (toe/M$ 2005). The GDP per capita is expressed in thousands of Uruguayan pesos at constant 2005 prices per inhabitant (thousand $ 2005/inh). Also, the energy path includes the constant final energy consumption per capita represented with isoquant curves and expressed in tonnes of oil equivalent per 1,000 inhabitants.

Between 1965 and 2020, Uruguay's energy path had an overall evolution towards economic growth and decreased energy intensity. Throughout these 56 years, it is possible to identify different behaviors associated with specific stages Uruguay has gone through.

In the 1965-1970 period, energy intensity fell, and GDP per capita increased. In 1971 and 1972, a particular behavior was recorded: energy demand grew. This, together with the GDP decrease, resulted in a significant increase in energy intensity that reached its all-time high (9.1 toe/M $ 2005). After that and for nine consecutive years, energy intensity decreased at an average annual rate of 3%, while the economy recorded sustained growth.

In turn, 1982 and 1983 recorded another particular feature: decreased GDP per capita and an increase in energy intensity which caused a downturn in the energy path. Over the 1983-1998 period, the evolution of indicators varied to some extent, but with a marked downward trend in energy intensity and the growth of GDP per capita.

The following years reflect the country's economic crisis at the beginning of the century through a further downturn of the energy path, marked by a decrease in GDP per capita and an almost constant energy consumption per GDP unit.

The 2002-2005 period was characterized by economic growth without significant structural changes. The construction sector does not show economic recovery in this post-crisis period. The production system's evolution did not involve investing in equipment and infrastructure as existing idle capacity was used. Additionally, energy demand declined until and including 2003, after which it resumed its upward trend. As GDP grew at a higher rate than energy consumption, energy intensity declined over this period.

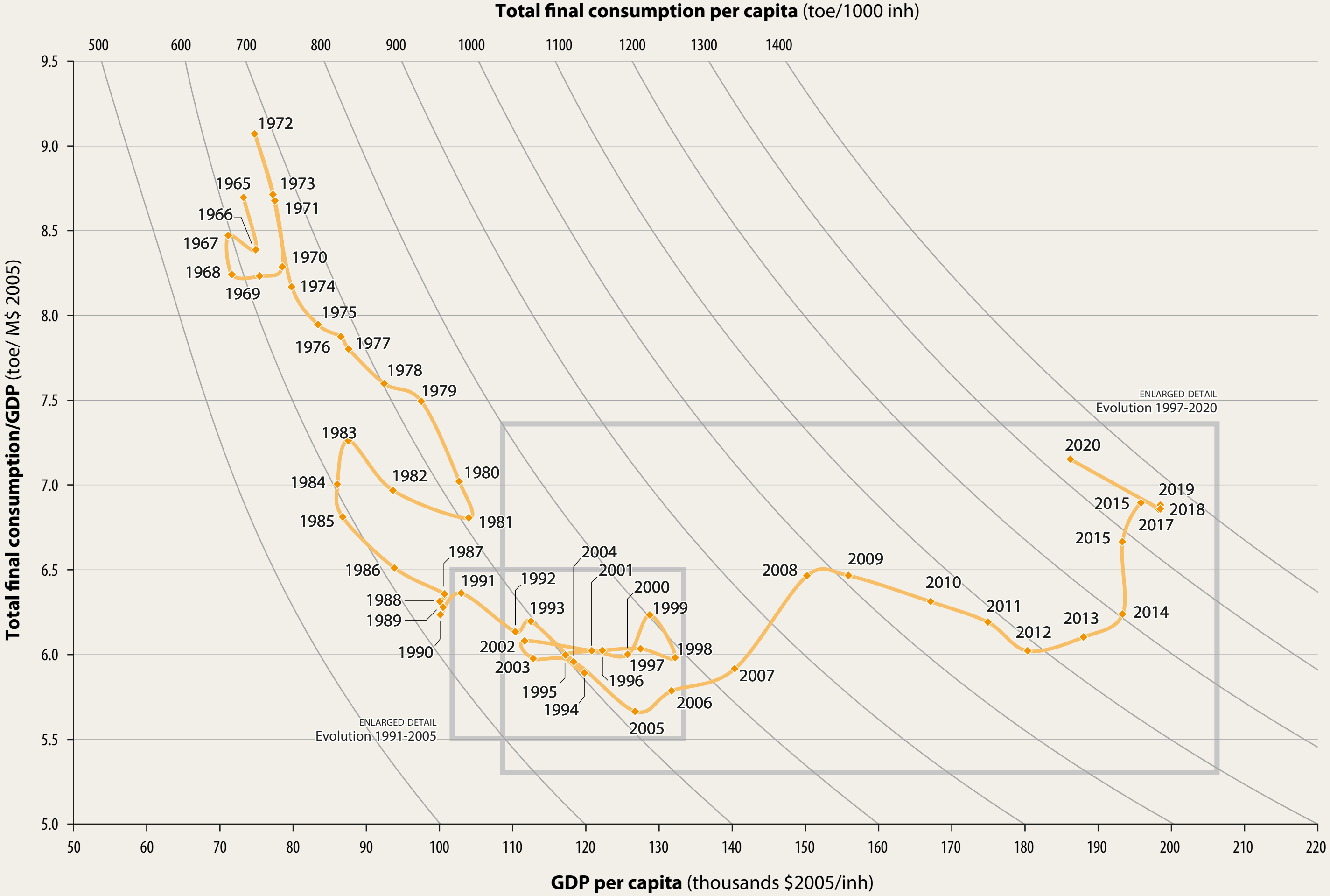
In the 2005-2009 period, the share of the industrial sector in GDP grew by one point and, within the industry, the share of the paper and cellulose branch increased from 9% to 19%. This robust industrial growth associated with the new cellulose plant and the development of the construction sector caused energy demand to soar. The industrial sector doubled its energy consumption; its final energy consumption, which had recorded annual growth rates of 3% and 4%, reached 17% in 2008. This notable change in the economic and energy structure led to considerable growth in energy intensity.

In turn, in 2009-2012, economic and energy consumption structures remained virtually constant. For this reason, the decrease in energy intensity could be linked to the implementation of energy efficiency projects and measures.

In the 2012-2016 period, energy demand underwent structural changes once again. The share of industrial consumption increased from 34% to 43% of total final energy consumption; this was strongly associated with the new cellulose plant. There is no significant change overall regarding the economic structure, given that the industrial sector continued to account for 15% of GDP. However, the analysis of industrial subsectors shows structural changes, as the paper and cellulose sector's added value grew from 19% to 28% compared to the whole industry. This behavior was similar to that recorded in the 2005-2009 period.

Additionally, the 2016-2019 period was similar to 2009-2012 in terms of energy intensity and GDP per capita but also showed an economic slowdown. This changed in 2020, and the pattern was similar to that described for 2002: the economy fell by almost 6%. This means that the path moves to the left as GDP per capita fell by 6% and energy intensity grew by 4%.

CHART 45. Energy path.



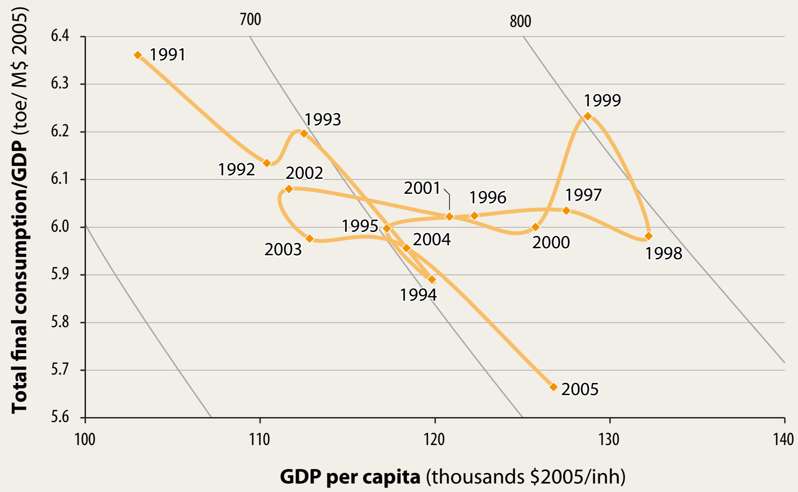
Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

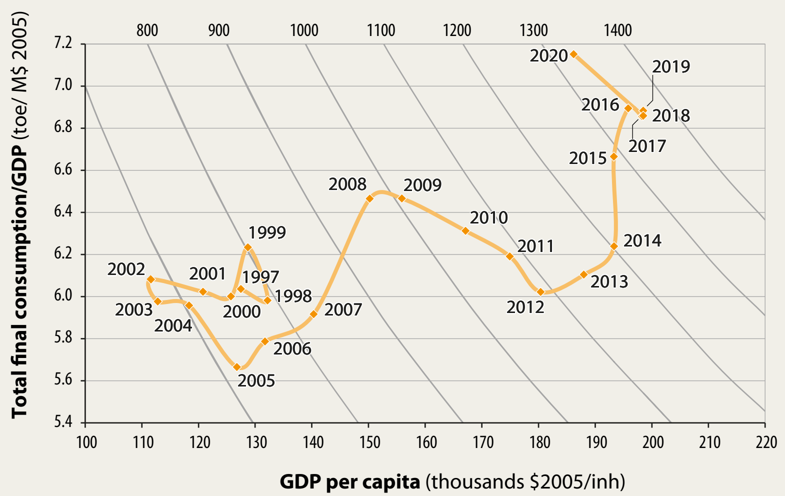
Finally, the third indicator represented in the energy path has already been mentioned in previous sections. It is interesting to observe its net growth evolution throughout the period, which alternates years of increases and decreases. Since 1965 and for 40 years, final consumption per capita has remained between 600 and 800 toe/1,000 inh. However, since 2005 there has been sustained growth of 718 toe/1,000 inh. (2005) to 1,332 toe/1,000 inh (2020), which practically doubled its value in the last 16 years. The maximum consumption per capita in this series was recorded in 2018: 1,366 toe/1,000 inh.

CHART 46. Energy path / enlarged details.

EVOLUTION 1991 - 2005



EVOLUTION 1997 - 2020



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

7. Sustainable Development Goal 7[13] (SDG 7)

The Sustainable Development Goals (SDG) approved by the United Nations (UN) in 2015 contemplate, in an integrated manner, the challenges around the three dimensions of sustainable development that are key to the future of the planet: economic, social, and environmental. The Government of Uruguay, working transversally at all the ministries, autonomous bodies, and decentralized services, has assumed the responsibility of guiding its public policies regarding the attainment of the SDGs to advance them towards 2030.

In particular, SDG 7 aims to ensure access to affordable, safe, sustainable, and modern energy for all; the MIEM is the relevant body in this regard.

By 2015, the country already had an Energy Policy first developed in 2005, in permanent dialogue with all the public stakeholders involved in energy. Although this policy was adopted in 2008, it had already been partially implemented. Furthermore, in 2010, it was endorsed by a multi-party commission formed by representatives of the entire political sector, thus becoming state policy. Although the Energy Policy was conceived and designed based on the country's reality and institutional capacities, it matches the content and timeframe (2030) that the United Nations defined for attaining the SDGs. This explains why by 2015, Uruguay already had indicators that reflected a transformed energy landscape that aimed at achieving SDG 7.

In this way, while Uruguay implements the 2030 Energy Policy, it is on the path defined by the United Nations to ensure access to affordable, reliable, sustainable, and modern energy for all.

13- Data taken from http://www.ods.gub.uy/ (August 2020).

In 2018, Uruguay reaffirmed its commitment to fulfilling the 2030 Agenda by voluntarily submitting the second country report to the UN. On that occasion, five SDGs were reported, including SDG 7: Affordable and clean energy.

SDG 7 indicators:

- 7.1.1. Proportion of population with access to electricity
- 7.1.2. Proportion of population with primary reliance on clean fuels and technology
- 7.2.1. Renewable energy share in the total final energy consumption
- 7.3.1. Energy intensity measured in terms of primary energy and GDP

For more information, please refer to "Uruguay's 2018 National Voluntary Review".

CHART 47. Proportion of population with access to electricity.

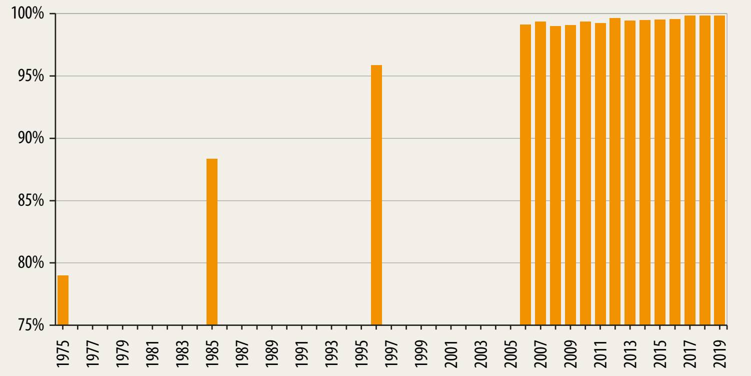


CHART 49. Renewable energy share in the total final energy consumption.

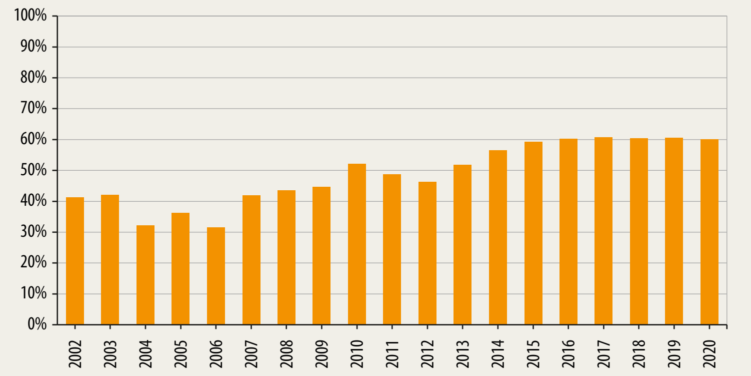


CHART 48. Proportion of population with primary reliance on clean fuels and technology.

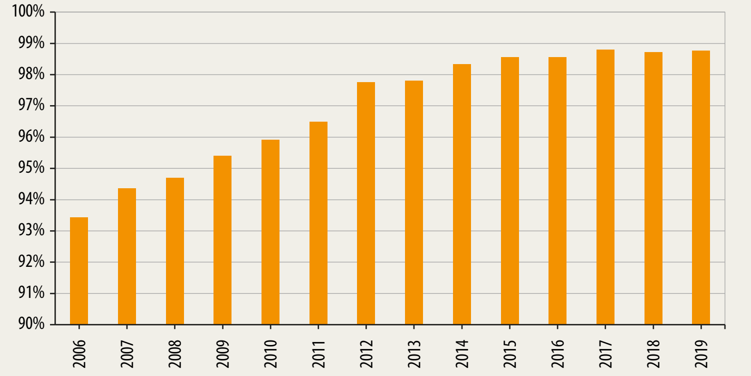
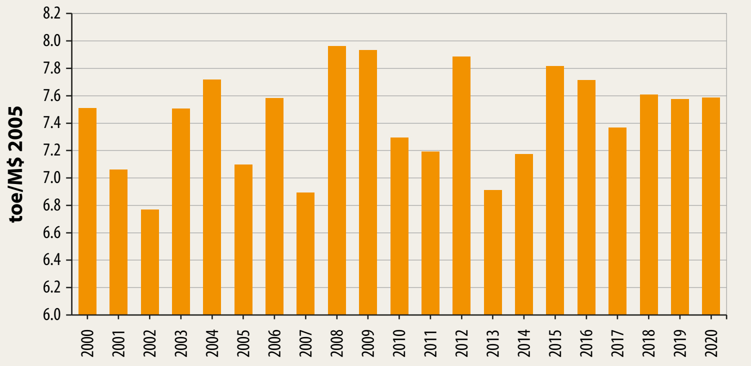


CHART 50. Energy intensity measured in terms of primary energy and GDP.



Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 24. Proportion of population with access to electricity [(1)].

	1975	1985	1996	2006	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**[(2)]
Total population (thousands of inhabitants) [(2)]	2,829	3,009	3,258	3,358	3,397	3,413	3,426	3,405	3,415	3,467	3,479	3,493	3,507	3,518	**N/D**
Population with access to electricity (thousands of inhabitants) [(2)]	2,234	2,658	3,124	3,329	3,375	3,387	3,414	3,386	3,398	3,451	3,464	3,487	3,502	3,513	**N/D**
Indicator 7.1.1 (%)	**79.0%**	**88.3%**	**95.9%**	**99.1%**	**99.4%**	**99.3%**	**99.6%**	**99.4%**	**99.5%**	**99.5%**	**99.6%**	**99.8%**	**99.9%**	**99.9%**	**N/D**

NOTE: 1) Estimate made by DNE-MIEM based on data from the INE Continuous Household Survey (ECH). **2)** The INE did not collect the information for 2020 (due to the pandemic).

TABLE 25. Proportion of population with primary reliance on clean fuels and technology [(1)].

	2006	2007	2008	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**[(3)]
Total population (thousands of inhabitants) [(2)]	3,358	3,359	3,363	3,378	3,397	3,413	3,426	3,405	3,415	3,467	3,479	3,493	3,507	3,518	**N/D**
Population with firewood or kerosene as the main energy source for cooking and heating (thousands of inhabitants) [(2)]	220	190	178	155	139	120	77	75	57	50	50	42	45	43	**N/D**
Indicator 7.1.2 (%)	**93.4%**	**94.4%**	**94.7%**	**95.4%**	**95.9%**	**96.5%**	**97.8%**	**97.8%**	**98.3%**	**98.6%**	**98.6%**	**98.8%**	**98.7%**	**98.8%**	**N/D**

NOTES: 1) Estimate made by DNE-MIEM based on data from the INE Continuous Household Survey (ECH). **2)** Firewood and kerosene used as the main sources for cooking and heating are not considered clean fuels and technologies. **3)** The INE did not collect the information for 2020 (due to the pandemic).

TABLE 26. Renewable energy share in the total final energy consumption [(1)].

	2002	2003	2004	2005	2006	2007	2008	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**[(3)]
Final energy consumption (ktoe)	2,228	2,201	2,288	2,353	2,505	2,713	3,183	3,331	3,518	3,636	3,652	3,850	4,088	4,387	4,612	4,648	4,669	4,669	**4,606**
Final energy consumption of renewables sources (ktoe) [(2)]	918	928	736	854	791	1,141	1,386	1,490	1,838	1,774	1,691	1,996	2,317	2,601	2,781	2,822	2,824	2,830	**2,768**
Indicator 7.2.1 (%)	**41.2%**	**42.1%**	**32.2%**	**36.3%**	**31.6%**	**42.0%**	**43.5%**	**44.7%**	**52.2%**	**48.8%**	**46.3%**	**51.9%**	**56.7%**	**59.3%**	**60.3%**	**60.7%**	**60.5%**	**60.6%**	**60.1%**

NOTE: 1) Indicator 7.2.1 of SDG 7. **2)** Electricity consumption is classified according to the matrix of electricity generation by source.

TABLE 27. Energy intensity measured in terms of primary energy and GDP [(1)].

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Primary energy (ktoe)	3,162	2,859	2,529	2,826	3,052	3,016	3,354	3,248	4,022	4,177	4,140	4,291	4,873	4,467	4,788	5,238	5,256	5,152	5,405	5,395	**5,402**
GDP (M$ 2005) [(*)]	421,157	404,967	373,655	376,664	395,513	425,018	442,438	471,380	505,207	526,646	567,742	597,050	618,174	646,842	667,792	670,268	681,594	692,689	695,999	698,438	**657,519**
Indicator 7.3.1 (toe/M$ 2005)[(2)]	**7.51**	**7.06**	**6.77**	**7.50**	**7.72**	**7.10**	**7.58**	**6.89**	**7.96**	**7.93**	**7.29**	**7.19**	**7.88**	**6.91**	**7.17**	**7.82**	**7.71**	**7.44**	**7.77**	**7.72**	**8.22**

NOTES: (*) Banco Central del Uruguay (BCU) / Central Bank of Uruguay (CBU): Cuadro_51a “Producto Interno Bruto por industrias. Serie anual a precios constantes referencia 2005 por empalme”. https://www.bcu.gub.uy/Estadisticas-e-Indicadores/Cuentas%20Nacionales/cuadro_51a.xls (01/06/2020). **1)** Indicador 7.3.1 del ODS7. **2)** “M$ 2005” corresponds to millions of Uruguayan pesos at constant 2005 prices.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8. Methodology

8.1. General definitions

- **Primary energy source:**
the energy source provided directly by nature, like hydropower and wind energy; after going through a mining process like hydrocarbons, natural gas, and coal; and through photosynthesis like firewood and biomass waste (from urban, agricultural, and agroindustrial activities).

- **Secondary energy source**:
the energy obtained from a primary source or from another secondary source after undergoing a physical-chemical process that modifies its original characteristics.

- **Gross energy:**
the primary or secondary energy to which the following deductions have not been applied: losses caused by transformation, transmission, transportation, distribution or storage, and amount of unused energy.

- **Net energy:**
the primary or secondary energy for consumption purposes, from which the losses mentioned above, and the unused energy have been deducted.

- **Final energy:**
the primary or secondary energy directly used by socioeconomic sectors. It is the energy that enters the consumption sector and is different from the previous one because of the energy sector's own use. It includes energy and non-energy consumption.

- **Transformation plant:**
facilities where primary or secondary energy undergoes processes that modify their properties or original nature through physical-chemical changes to transform it into energy more suitable for consumption. They are classified into primary, if they only process primary sources, and secondary, if primary and/or secondary sources enter the transformation plant.

- **Consumption sector:**
part of the socioeconomic activity where final energy for its use converges. Own use is considered separately. It corresponds to the energy consumed by the energy sector for production, transformation, transportation, and distribution of energy (it does not include the energy used as input for transformation into other kinds of energy).

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8.2. Structure

The National Energy Balance (BEN) provides a representation of the energy system's structure and operation. This is done in an organized and systematic manner, summarizing the information in a general summary matrix called a "consolidated matrix." This matrix makes it possible to analyze all the processes and transformations of a specific source throughout the entire system and each category and the magnitude corresponding to each source. The general summary matrix includes the following five submatrices:

- Primary energy balance
- Balance of transformation plants (primary and secondary)
- Secondary energy balance
- Gross supply and net consumption
- Distribution of final energy consumption by sector

The following image shows how these submatrices are located in the summary matrix. These submatrices are analyzed below.

<table>
<tr><th>ENERGY BALANCE</th><th>Primary Sources</th><th>Secondary Sources</th><th>Losses</th><th>TOTAL</th></tr>
<tr><td>Primary energy</td><td>(1)</td><td></td><td></td><td></td></tr>
<tr><td>Transformation plants</td><td colspan="3">(2)</td><td></td></tr>
<tr><td>Secondary energy</td><td></td><td>(3)</td><td></td><td></td></tr>
<tr><td>Gross supply and net consumption</td><td colspan="2">(4)</td><td></td><td>(4)</td></tr>
<tr><td>Final energy consumption</td><td colspan="2">(5)</td><td></td><td>(5)</td></tr>
</table>

NOTAS:
(1) Primary energy balance.
(2) Balance of transformation plants.
(3) Secondary energy balance.
(4) Gross supply and net consumption.
(5) Distribution of the final energy consumption by sector.

The matrix summary has the same format for all the historical series; however, it is modified as new energy sources appear or when more detailed information is available, hiding or showing the relevant fields. It is essential to mention the greater disaggregation in the consumption sectors (available from 2013) and the breakdown by source for power plants for public service and autoproduction (available from 2010).

8.2.1. Balance of primary energy sources

It corresponds to the supply of primary energy sources. This BEN edition includes crude oil, coal, natural gas, hydropower, wind energy, solar energy, firewood, biomass waste, biomass for biofuels, and industrial waste.

There follows additional information about some of the primary sources:

- **Coal:**
it includes anthracite, peat, soft coal tar, and pitch.

- **Natural gas:**
the data are considered under standard conditions (1 atm and 15°C).

- **Hydropower:**
the summary matrices include the theoretical equivalent. However, the "supplementary information" section includes a hydropower chart considering the thermal equivalent.

- **Solar energy:**
it includes photovoltaic solar energy and solar thermal energy.

- **Biomass waste:**
it includes rice and sunflower husk, sugar cane bagasse, black

liquor, odorous gases, methanol, barley husk, and timber industry's waste.

- **Biomass for biofuels production:**
it includes sugar cane, sweet sorghum, soy, sunflower, canola, fat, etc.

- **Industrial waste:**
it includes end-of-life tires, used oils, glycerin, and alternative liquid fuels.

The primary energy balance includes eight categories: production, import, export, losses, stock change, not used, adjustments, and supply. Since the categories also apply to the secondary energy balance, the definitions for both cases are listed below:

- **Production**:
the amount of primary energy extracted from nature or secondary energy originated in a transformation center.

- **Import**:
the primary or secondary energy that comes from abroad.

- **Export**:
the primary or secondary energy that is sent abroad. Exports to the free trade zone are not considered exports; they are included in the final consumption as sales in the domestic market.

- **Losses**:
the energy losses caused by transportation, storage, transmission, and distribution (technical losses). Until 2005, nontechnical losses in the electricity sector were recorded as losses. Since 2006, they have been recorded in final consumption, considering the social losses within the residential sector. The remaining nontechnical losses have been distributed according to the share percentage in the other sectors' electricity consumption.

- **Stock change**:
is the difference between the stock of an energy source by December 31 of year i1and December 31 of year i.

- **Energy not used**:
is the amount of energy that, for the technical and/or economic nature of its exploitation, is not currently being used.

- **Adjustments:**
statistical adjustment that makes supply and consumption data compatible, as well as the differences due to the rounding of figures.

- **Supply**:
is the total energy really available for consumption. It is obtained with the following equation:

Supply = Production + Import - Export - Losses + Stock exchange - Energy not used + Adjustments.

Notes:
In the summary matrices, the values "export," "losses" and "energy not used" appear with a negative sign, so the "supply" value is obtained algebraically adding these values to the ones corresponding to "production," "import," "stock change," and "adjustments."

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8.2.2. Balance of transformation plants

It reflects the activity of both primary and secondary transformation plants. Negative signs indicate income (inputs), and positive signs indicate expenditure (products). Because of the processes conducted in these plants, there are transformation losses obtained by algebraically adding the income to the spending.

Transformation plants include:

- **Refinery:**
industrial facilities where crude oil undergoes physical and chemical transformation processes to obtain compounds and products of greater market value.

- **Power plants for public service:**
they include power plants that deliver the electricity generated to the grid, for example, hydroelectric power plants, wind, photovoltaic solar, and thermoelectric plants.

- **Autoproduction power plants:**
power plants where the electricity produced is to be consumed by the autoproducer himself, excluding delivery to the grid.

- **Biomass distilleries:**
industrial plants where bioethanol is produced.

- **Biodiesel plants:**
industrial plants where biodiesel is produced.

- **Coal plants:**
transformation plant where charcoal is produced from firewood.

- **Gas plants**:
transformation plants where gas is manufactured from light naphtha.

- **Coke-oven plants:**
transformation plants where coke of coal is produced.

Cogeneration plants have a global efficiency of between 70% and 85%. Such efficiency depends on the type of technology used and how the energy is used. Global efficiency is defined as the ratio of the total energy produced by the system (electricity and heat) versus the energy consumed.

8.2.3. Balance of secondary energy sources

It corresponds to the supply of secondary energy sources. The following secondary energy sources are included in this BEN edition: LPG, motor gasoline, aviation gasoline, kerosene, jet fuel, gas oil, fuel oil, petcoke, non-energy products, fuel gas, bioethanol, biodiesel, coke of coal, charcoal, and electricity. Other secondary sources are light naphtha, diesel oil, and manufactured gas, which, though not currently used in the country, are included in the years of the historical series when applicable.

There follows additional information about some of the secondary sources:

- It should be noted that the 2020 edition improves the allocation of LPG consumption in the various activity sectors. For this reason, other classification criteria are implicit in the sectoral consumption of LPG until 2019. LPG consumption in the sector "other agricultural activities" in 2019 was estimated based on the total value of "agriculture" and the new consumption estimate in the "poultry farms" area. Therefore, the 2020 decrease in consumption is partly due to a change in methodology.

- **Motor gasoline:**
bioethanol is not included and is informed separately.

- **Gas oil:**
biodiesel is not included and is informed separately.

- **Petcoke:**
it includes scorched and non-scorched petcoke and refinery coke. Until and including BEN 2012, it was referred to as “other energy products.” Scorched petcoke is recorded as nonenergy use.

- **Non-energy products:**
solvents, lubricants, and asphalts. Liquid sulfur has been included as a new non-energy product since 2013, with the startup of the desulfurization plant.

- **Fuel gas:**
production was considered equal to own use until and including 2012. The “not used” volume and the “losses” have been included since 2013; as a result, production is greater than the refinery’s “own use.” This change in methodology has been applied since 2013.

- **Coke of coal:**
it corresponds to coke of soft coal. Until the BEN 2012, it was referred to as “coke.”

- **Electricity:**
electricity consumption for transport over the last few years includes captive and private fleets.

The categories that correspond to the secondary energy balance are the same as the ones previously described for primary energy, except for an additional category:

- **International bunker**:
the energy sold to sea vessels and aircraft on international journeys, that is, journeys that leave one country and reach another. This activity is included under “exports ” until 2012 and is represented independently from 2013 onwards.

8.2.4. Gross supply and consumption

This sub-matrix presents the gross energy supply and the total net consumption with the itemization of its components.

- **Gross supply:**
the supply of each energy source precisely as found in the corresponding balance, plus the losses and amounts not used (reported in the same balance).

Unlike other rows in the matrix, the total gross supply is not obtained by adding the primary and the secondary energy sources. Such an addition would result in duplicates: the production of secondary sources plus the primary sources from which they were obtained. Therefore, the correct way to calculate it is by deducting the production of secondary sources from the addition.

- **Total net consumption:**
the total final consumption plus the energy sector’s own use.

- **Own use:**
the amount of primary and/or secondary energy that the energy sector uses for its own operation, including the production, transformation, transportation, and energy distribution. It does not include the energy used as input to transform it into another kind of power at transformation plants.

- **Total final consumption:**
the addition of the final energy consumption and the non-energy consumption.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8.2.5. Distribution of final energy consumption by sector

This last part of the consolidated matrix indicates the distribution of final energy consumption among the different socioeconomic activity sectors. Since the compilation of the BEN 2013, the collection of consumption data has improved through sector surveys. The traditional survey on firewood and biomass waste consumption became part of the industrial survey (which covers other energy sources). It was conducted in 2011, 2013, 2014, 2015, 2016, 2017, 2018, and 2020. Energy consumption surveys were also conducted in the residential sector in 2013 and the commercial/services/public sector in 2013, 2014, and 2015. It must be noted that the results of the latest survey will be included in future editions. This BEN edition is improved as it includes surveys conducted in the mining sector and the “poultry farms” area in the agricultural sector.

Additionally, final energy consumption was first reported in 2013, with a broader disaggregation of sectors. Sector consumptions lower than 1 ktoe are not reported since they represent marginal values, except when they correspond only to one subsector. In other cases, data are not disaggregated if they correspond only to one company by sector or if there is no available information for classification.

The classification adopted for sectors and subsectors is the following:

- **Residential sector:**
it includes the caloric, electric, and mechanic consumption of rural and urban families to meet the energy needs of households. The consumption from personal transportation is not included here but in the transport sector.

Consumption was first reported in 2013 with the following criteria:

Residential sector
Montevideo
Rest of the country

In the case of firewood and LPG, the information is disaggregated according to the results of the consumption survey in the sector in 2013. In contrast, for electricity, kerosene, and natural gas, administrative data are used. As per biomass waste, total consumption is associated with the rest of the country. The breakdown of the other energy sources has not been reported since 2013 because there was no information for its adequate classification (solar, gas oil, fuel oil, charcoal).

- **Commercial/services/public sector:**
It includes tertiary sector activities such as schools, hospitals, stores, hotels, restaurants, public lighting, public administration, etc. It includes section D to section U according to the International Standard Industrial Classification (ISIC) revision 4 and public lighting.

Consumption was first reported in 2013 with the following breakdown:

Commercial/services/public sector	Associated ISIC Revision 4
Public lighting	-
Public administration and defense	Section O
Electricity, gas, and water	Sections D and E
Others	Sections G, H*, I, J, K, L, M, N, P, Q, R, S, T and U

NOTE: (*) This includes only consumption within the establishments.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

- **Transport sector:**

It includes public transportation of people and cargo carried by air, road, or water. It does not include internal transportation within the establishments that are included in the other sectors. International air and fluvial travel are not included. Their consumption is recorded under exports until 2012 and within international bunkers as of 2013.

Consumption was first reported in 2013 with the following breakdown:

Transport sector
Road
Rail
Air
Sea and river

Private vehicles are considered in the results obtained from the consumption surveys in the residential and industrial sectors in 2013, which collected this information.

- **Industrial sector:**

it includes the manufacturing industry and the construction sector, corresponding to Sections C and F in the industrial classification ISIC Rev. 4, respectively. It is essential to mention that agro-industries and the fishing industry are considered within this sector.

This sector's consumption was first reported in 2013, with the following breakdown:

Industrial sector	Associated ISIC Revision 4
Slaughterhouses	Group 101
Dairy products	Group 105
Mills	Class 1061
Other food industries	Groups 102, 103, 104, 107, and 108
Beverages and tobacco	Divisions 11 and 12
Textile	Divisions 13 and 14
Leather	Division 15
Wood	Division 16
Paper and cellulose	Divisions 17 and 18
Chemical, rubber, and plastic	Divisions 19*, 20, 21 and 22
Cement	Classes 2394 and 2395
Other manufacturing industries and construction	Division 23** / Divisions 24 to 33 / Section F

NOTES: (*) Excluding the refinery (19201); its consumption is considered under "Own use."
(**) Including all the classes of division 23 except for the ones corresponding to the "Cement" section.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

- **Primary activities:**

It is the production of agriculture, cattle, and timber extraction plus commercial deep sea, littoral, coastal, and estuary fishing, including factory ships and fleets that fish and manufacture the resulting products. Mining is also included. It was called "agriculture/fishing/mining sector" until BEN 2019.

This sector's consumption was first reported in 2013, with the following breakdown:

Primary activities
Agriculture
Mining
Fishing

Agriculture: This sector includes the consumption of fuels by agricultural aircraft (jet fuel and aviation gasoline). An annual company survey has been conducted since 2016. This consumption was included in the transport sector until 2015. In 2020, 100% of the respondents provided information, so the data reflects the actual situation of the sector.

This publication includes further improvements: in the agricultural sector we identify the consumption of poultry farms, separating it from the other agricultural subsectors. This disaggregation has been implemented since 2019:

Agricultural sector
Poultry farms
Other agricultural activities

An energy consumption survey was conducted among Uruguayan poultry farms in 2020, with a response rate of 50%, but representing 81% of national production. Technical coefficients of energy consumption per head of poultry were calculated, and the results were scaled up to obtain nationwide figures (INAC data). This survey was also used to obtain information for 2019.

Additionally, the estimated consumption of the rest of the energy sources for the other agricultural subsectors was revised and improved by considering other information sources—mainly data from the gas distribution companies. Other information sources analyzed were various publications, such as the "2006 Energy Use and Consumption Survey" and MGAP (Ministry of Livestock, Agriculture and Fisheries) reports and studies, particularly those conducted by OPYPA regarding the intermediate consumption of agricultural activities. After analyzing these reports and considering DIEA (Agricultural Statistics Office) data publications, we developed technical coefficients. Depending on each activity, in some cases, these were liters/hectare, and in others, such as dairy, liters/liters of milk produced, or liters/head, in the case of cattle. This made it possible to obtain the energy consumption for different years. This was further analyzed in terms of gas oil and gasoline consumption in the sector.

Mining: In this BEN edition, we disaggregated the mining sector statistics, which until BEN 2019 were reported with agriculture. A company survey was conducted, allowing us to interview 50% of the mines in Uruguay. The consumption of the different energy sources was obtained and technical coefficients of mineral consumption/production were calculated. The national mineral production data (provided by DINAMIGE) allowed us to obtain national energy consumption results for 2019 and 2020.

The data on electricity consumption is obtained from the UTE database and by cross-checking information with the surveys.

Fishing: The industrial fishing estimations (obtained from administrative data of fuel sales) have been compared to the volume declared in the National Directorate for Water Resources (DINARA) registries of MGAP by sampling the 2013 records. As of 2014, the administrative data on nonindustrial fishing comes from the General Registry of Fishing and the existing tax exemption agreement to purchase fuel.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

- **Not identified:**
a sixth category that includes consumption coming from unidentified sectors. Propane gas (LPG) includes the consumption of companies whose main activity is classified as Section V of ISIC, Revision 4 (corresponding to the annex included by Uruguay on the exclusive use of local agencies).

8.3. Units and data format

The unit adopted to express the energy flows comprising the National Energy Balance is the ktoe (thousands of tonnes of oil equivalent).

1 ktoe = 1,000 toe
1 toe = 10,000,000 kcal

The conversion of the magnitudes corresponding to each source to its expression in toe is done through its respective Lower Heating Value (LHV). The 0.086 toe/MWh technical criterion is applied in the case of electricity. Please note that the possible decimal differences in the values informed in tables, charts, and texts result from the rounding of figures. In turn, the addition of subtotals may not reproduce the exact total for the same reason.

Finally, when a value is represented as "0" (zero), it means it exists and is minimal (less than 0.1). When the cell appears empty, it means that the flow does not correspond to Uruguay or that the information necessary to quantify the magnitude is not available.

8.4. Special comments

8.4.1. Hydroelectric energy

Two approaches can be used to evaluate hydropower: the theoretical equivalent and the thermal equivalent. In the first case, turbine flow determines the energy that enters primary transformation plants (hydroelectric power plants).

Hydropower production is calculated as follows:

$$E_{hydro} = k \times ß \times g \times t \times h \times Q$$

Where:

- **E_{hydro}:** hydropower production (kWh/year)
- **k:** Ratio for the transformation of units
- **ß:** Water density (kg/m^3)
- **g:** Gravity acceleration (m/s^2)
- **t:** Operational time of the plant (hours/year)
- **h:** Average fall height (m); the height of the daily water levels is considered.
- **Q:** Turbine flow (m^3/s)

The other approach (thermal-equivalent approach) evaluates hydropower production from the electricity generated at the hydroelectric power plants, considering the amount of hydrocarbons that would be needed to produce it at a conventional thermal power plant. This fictitious thermal power plant's performance is considered equal to the average performance of the existing thermal power plant, which operates in normal conditions.

The theoretical equivalent approach is used in the "general summary matrix."

8.4.2. Wind energy

As of 2008, many wind farms connected to the country's grid began to operate. This is why wind energy is included in the balance matrix from that year. No values are included for wind energy for previous years because current estimations about the number of windmills and wind turbines vary greatly depending on the information source.

The methodology applied by OLADE is used to determine wind energy. This is done from the generation of electricity of each farm/wind turbine, considering the same value as the electricity generated as "wind energy produced." Data on electricity generated from wind power, both large-scale and from micro-generation, are supplied by UTE.

The BEN 2020 introduces the concept of unused wind energy due to operational restrictions (OR). This concept stems from a decree, where UTE is urged to pay for energy to wind energy generators that can generate energy. Still, this energy is not dispatched because of operational restrictions set by the National Load Dispatcher.

Operational restrictions are the generation reductions imposed by the Electricity Market Administrator (ADME) for the safe operation of the system. In particular, an operational restriction due to excess generation entails limiting generation when the total generation, if not reduced, would exceed the energy demand (Uruguayan demand plus export) minus the reserve margin and forcings defined by ADME for the safe operation of the SIN.
ADME provides data on the wind not used by each generator according to their OR, as described above.

The 2018-2020 series for unused wind power is completed.

Below are the links to the documents on the OR calculation models:

https://adme.com.uy/imasd/simsee_principal/adme_windsim.php

https://adme.com.uy/db-docs/Docs_secciones/nid_78/ProcedimientoParaGestiondeRestriccionesOperativas_v201512091831.pdf

https://adme.com.uy/db-docs/Docs_secciones/nid_324/ModeloCentralGeneradoraEolica.pdf

https://adme.com.uy/db-docs/Docs_secciones/nid_324/ModeloCentralGeneradoraEolica_17_12_2015_ULTIMAVERSION_v2.pdf

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8.4.3. Solar energy

The BEN 2014 included solar energy estimations for the first time, as well as solar thermal and photovoltaic energy.

- **Solar thermal energy:**

the total aperture area of both imported and domestically manufactured equipment is obtained to make solar thermal energy estimations. The lack of stock for a few months is considered to estimate solar thermal energy. Therefore, what was imported/produced in one year is installed practically in the same year. The estimated shelf life is 15 years; this is considered to determine the cumulative equipment installed.

In 2017, local manufacturers were surveyed to determine the domestic production of solar thermal collectors. Therefore, the area of domestic production installed has been reported since that year. Up to and including 2016, the share of national producers is estimated to be 20% of the total.

The energy generated is calculated from the annual average irradiance on a horizontal plane and the installed area, considering a global efficiency of 40%:

$$E_{\text{solar thermal}} = Ef \times H_0 \times A \times \frac{0.086\left(\frac{\text{toe}}{\text{MWh}}\right)}{1{,}000{,}000}$$

Where:

$E_{\text{solar thermal}}$: Production of solar thermal energy (ktoe/year)
Ef: Global efficiency (0.40)
H_0: Annual average irradiance on a horizontal plane (kWh/m^2-year)
A: Aperture area of solar thermal collectors/heaters (m^2)

The solar thermal energy generated corresponds to the energy available for heating water. The balance standpoint can be interpreted as a "potential" since it is not the energy consumed but the energy captured by the equipment. In practice, not all this energy may be consumed.

Until 2016, the sector allocation of the final energy consumption is theoretical, as it considers the ordinary shares in the literature: 85% residential sector, 14.5% commercial/services/public sector and 0.5% industrial sector. This information cannot be collected in the periodic surveys by sector because the sample size does not reflect the population using this technology.

Since 2017, an industrial consumption value associated with the area surveyed in the annual industrial survey has been estimated; since 2019, it has been supplemented with the imports of industrial companies. The theoretical share for the commercial/services/public sector was maintained, and the balance was closed with the residential sector.

Furthermore, reference is made to the solar technology census conducted in 2018 among companies and institutions in the commercial and services areas. Only the subsectors most likely to own solar equipment under the Solar Thermal Energy Law (Law 18,585 of September 2009) were surveyed. The census and other surveys conducted in the sector made it possible to estimate an installed area of 5,783 m2 of solar thermal collectors, equivalent to 0.3 ktoe. A higher value was verified for the theoretical estimate applied to the commercial/services/public sector. For this reason, the data collected in these statistical studies are correctly included in the calculation since the total number of companies in the industry using this technology is unknown.

- **Photovoltaic solar energy:**

the methodology applied by OLADE and other international bodies is used to determine photovoltaic solar energy. This methodology considers the same value as the electricity generated as "photovoltaic energy produced." This methodology has been applied since BEN 2015 for the series since 2014.

Electricity generation with photovoltaic panels is determined in diverse ways depending on the installed capacity of the equipment. They can be regrouped into two types of producers:

01. Producers with an installed capacity greater than 150 kW.

– Solar plants connected to the grid; the annual data supplied by UTE is considered.

– Off-grid producers with an installed capacity greater than 150 kW and who do not deliver energy to the grid are surveyed.

02. Producers with an installed capacity lower than 150 kW (microgenerators).

– Small producers who deliver energy to the grid; the annual microgeneration data provided by UTE is used. As of 2019, UTE has not provided annual generation data, so a theoretical annual generation is estimated from the installed capacity data. UTE's information on energy delivered to the grid is available, and the difference is used to obtain the data on self-consumed energy.

– For small off-grid producers, with installed capacities estimated to be lower than 150 kW, we use the same relation between energy generated and installed capacity of the producers who deliver to the grid and whose data is known. A survey is conducted for the rest of the small off-grid producers whose information is known.

The BEN 2020 introduces the concept of unused photovoltaic solar energy due to operational restrictions. This concept stems from a decree, where UTE is urged to pay for energy to photovoltaic solar generators that can generate energy. Still, this energy is not dispatched because of operational restrictions set by the National Load Dispatcher.

Operational restrictions are the generation reductions imposed by the Electricity Market Administrator (ADME) for the safe operation of the system.
In particular, an operational restriction due to excess generation entails limiting generation when the total generation, if not reduced, would exceed the energy demand (Uruguayan demand plus export) minus the reserve margin and forcings defined by ADME for the safe operation of the SIN.
ADME provides data on the unused solar energy in each photovoltaic plant according to their OR, as described above.

The 2018-2020 series for unused photovoltaic solar energy is completed.

Below are the links to the documents on the OR calculation models:

https://adme.com.uy/imasd/simsee_principal/adme_windsim.php

https://adme.com.uy/db-docs/Docs_secciones/nid_324/ModeloSolarPV.pdf

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8.4.4. Firewood

Regarding firewood, production is considered the total energy consumption of firewood plus the firewood used in the following transformation plants: power plants for public service, autoproduction power plants, and coal plants.

For the industrial sector, firewood consumption is estimated based on surveys conducted annually by DNE-MIEM. If the industrial survey is not conducted in a given year, firewood use is calculated based on previous years' consumption. For the rest of the sectors, this survey is not annual. In years with no survey, the consumption value of the last survey is used. In the BEN 2020, firewood consumption in the "primary activities" sector was adjusted according to the 2015 OPYPA report on the sector and the 2020 poultry subsector survey.

Firewood entering power plants for public service and autoproduction power plants is estimated based on the surveys conducted by DNE-MIEM each year. The firewood that enters coal plants is calculated based on the non-imported charcoal, which has not happened again since 2004.

8.4.5. Biomass waste

The production of biomass waste is recorded as the addition of energy consumption and the inputs of transformation plants. There is no information to estimate the unused production of other kinds of biomass waste, such as forestry waste. This criterion, widely used in other countries, has been applied since 2008.

In previous years, the production of biomass waste was estimated considering the annual production of the crops that generate them (i.e., rice, sunflower, barley) and the proportion of waste within the total weight, taking as the source of information the statistical yearbooks of the Agricultural Statistics Office (DIEA) of the MGAP. Production was significantly higher than the consumption of these energy sources following these criteria.

Additionally, as of 2008, consumption of forestry and sawmill waste (chips, sawdust, etc.) has been recorded, which was not the case in previous BEN editions.

In the case of the industrial sector and power plants for public service and autoproduction, consumption of biomass waste is estimated based on data-collection, surveys administered annually by the DNE-MIEM to companies that use this source as energy. As for the residential sector, the "2006 Energy Use and Consumption Survey" results and the "2013 Residential Survey" have been used in the last few years.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8.4.6. Biomass for biofuels

The primary energy source called "biomass for biofuels" includes the consumption of primary energy sources (grains, crude oils, sugarcane juice, etc.) associated with biofuel production. It has been included in BEN since 2010.

It is worth mentioning that biomass consumption for biofuels is taken as an estimation to include biofuels in the energy matrix. These values will be different from those obtained when applying other types of methodology not described in this document.

- **Biomass for bioethanol production:** the production considered corresponds to the Bella Unión and Paysandú plants.

– Bella Unión sugar factory:

As there are no reliable values of sugar consumption in the sugarcane juice with a breakdown of the actual consumption of each process, the amount of primary source used for bioethanol is estimated using the production data of bioethanol/sugar, considering the average performance of the sugar-alcohol factory (fermentation + distillation), as well as other factors (stoichiometric factors, density, heating value, etc.).

Biomass estimation for the production of bioethanol from sugar cane is made using the equation below (Eq. 1):

$$\textbf{Biomass fot bioethanol} \text{ (ktoe)} = \frac{\text{Bioethanol Prod. (m}^3\text{)}}{(\text{TP} \times \text{AFP} \times \text{EMP})} \times \frac{\text{LHV Sugar (kcal/kg)}}{10{,}000{,}000}$$

Where:

TP: Theoretical Performance (m^3 bioethanol / t sugar)

AFP: Average performance of sugar-alcohol factory (fermentation + distillation)

EMP: Extraction-milling performance ratio

LHV sugar: Lower heating value of reducing sugars. Taking the value of 4,000 kcal/g (data from the literature)

Determination of the theoretical performance of ethanol production (TP):

The chemical reaction of ethanol production is considered from the reducing sugars and their stoichiometric ratio. Then, the TP is determined from ethanol density in the adequate units for its use in the equation above.

Chemical reaction			
	$C_6H_{12}O_6$ -------	2 CH_3CH_2OH +	2 CO_2
Stoichiometric ratio			
	180 g	92 g	88 g
Theoretical performance (TP)			
92 g of produced ethanol every 180 g of consumed sugar			
Bioethanol density			
0.7915 kg/l			
Theoretical performance (TP)			
0.6457 m^3 bioethanol / sugar tonne			

Therefore, Eq. 1 results in the following simplified equation (Eq.2):

$$\textbf{Biomass for bioethanol} \text{ (ktoe)} = \frac{[\,4 \times \text{Bioethanol Prod. (m}^3\text{)}\,]}{[\,\text{TP} \times \text{EMP} \times 6{,}457\,]}$$

The sugar-alcohol sector reported the data corresponding to ethanol production, the average performance of the sugar factory, and the extraction-milling performance ratio. Additionally, in recent years, the amount of sweet sorghum used for bioethanol production was negligible compared to the total amount of sugar cane, so it is considered similar.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

– Paysandú sugar factory:

Primary source consumption for bioethanol production from grains is directly estimated using the actual amount of grains processed, considering the average humidity and the heating value for this raw material. The sugar factory provides both grain consumption and average humidity, while a 4,000 kcal/kg heating value is considered for grains (data from the literature). The following grains are processed: sorghum, wheat, and maize.

- **Biomass for biodiesel production:** the kind of grain and the heating values included in the literature are considered to estimate the primary sources. Biodiesel production has been from soy and rapeseed in the last few years, and sunflower was not used. Fat is also considered a primary source for biodiesel production, as well as crude oil and cooking oil. These are the reference values used for the heating values:

– Soy: 2,050 kcal/kg

– Sunflower: 5,189 kcal/kg

– Fat: 9,200 kcal/kg

– Rapeseed: it is calculated considering a 44% oil content in the seed and an oil heating value of 8,811 kcal (data from the literature).

– Other oils: without specific composition data, the heating value of a mix with 80% sunflower oil and 20% soy oil was considered, thus resulting in a value of 8,527 kcal/kg.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8.4.7. Biogas

The electricity generated with biogas produced from urban waste in Las Rosas plant in Maldonado (since 2005) was not recorded in the value corresponding to the electricity supply until 2007. In 2008 it was first included in electricity production at power plants for public service. In 2004, the second generator of electricity produced from biogas was included. It was produced by treating the effluents of a wool washing plant. In 2019, the third generator of electricity produced from biogas was included. It was produced from the treatment of effluents of a dairy farm. The three generators are included within electricity production at "power plants for public service". Biogas (expressed as methane) is considered the primary source of this electricity. These values are minimal compared to the total (around 0.3 ktoe). This source is considered biomass waste.

8.4.8. CO_2 emissions

The BEN includes the CO_2 emissions from fuel combustion activities of the energy industries and the consumption sectors. Furthermore, CO_2 emissions from biomass combustion and international bunkers are included as memo items since they are not considered in the totals. The series began in 1990.

CO_2 emissions are calculated according to the "2006 IPCC Guidelines for National Greenhouse Gas Inventories".

These are the categories reported:

- **Energy industries:** the emissions of the following secondary transformation plants are considered and the energy sector's own use. CO_2 emissions from autoproduction power plants are included in the industrial sector, according to the methodology applied.
  - Power plants for public service
  - Own use
- **Consumption sectors:** the same sectors included in the BEN and detailed in the "structure" section of this methodology description are considered.
  - Residential
  - Commercial/services/public sector
  - Transport
  - Industrial
  - Primary activities
  - Not identified
- **Memo items:** they are presented separately and are not included in the total CO_2 emissions of the following categories:
  - Biomass combustion: it includes firewood, biomass waste, and charcoal for the whole period and biofuels as of 2010. This category's emissions correspond to biomass combustion in power plants for public service, autoproduction power plants, and in the different activity sectors.
  - International bunkers: it corresponds to the emissions from international bunkers, both sea, and air bunkers.

Default CO_2 Emission factors (EF) for combustion are used to estimate the emissions. They are presented in Chart 1.4 of the "2006 IPCC Guidelines. Volume 2: Energy".

In turn, the series of CO_2 emissions by source since 2006 has been included since the BEN 2016. BEN 2019 includes the series of CO_2 emissions broken down by source and sector. This is done for the main categories associated with emissions from each source.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

8.4.9. Primary energy matrix (supply)

In the primary matrix, also called the matrix of supply, the provision of energy to the country is presented with the following breakdown: electricity, solar energy, oil and oil products, natural gas, biomass, and coal/coke. The supply activities for each energy source are considered for preparing the matrix (production, import, export, and international bunker).

In the case of electricity, the production of electricity of hydraulic, wind and photovoltaic solar origin is considered, as well as the amount imported from neighboring countries. If there is any import for transit, it must be deducted from the total imports for that year. Since 2010, the matrix of results has included the electricity generated by power plants, disaggregated by source.

Regarding hydrocarbons, the imports of oil and natural gas are reported, and the net balance of foreign trade of oil products, which is calculated as the difference between imports and exports (including international bunker).

In the case of biomass, the production of firewood, biomass waste, and biomass for biofuels is considered, as well as net charcoal imports. Finally, to quantify coal and coke supply, the import of mineral coal and coke of coal is recorded.

Solar thermal energy has been reported in the primary matrix since 2017, considering its production, along with photovoltaic solar electricity. Both sources are grouped under the term “solar.”

The analysis of energy supply by source is presented, as well as two additional classifications:

By origin:

- Local: national production
- Imported: net imports

By type:

- Renewable: hydroelectricity, wind and solar photovoltaic, biomass, and solar thermal energy.
- Nonrenewable: natural gas, oil and oil products, coal, and coke.
- Imported electricity.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

ANNEX I.
Suplementary information

I.1. Unit conversions

TABLE 28. Most common prefixes for multiple and submultiple units.

Multiple	Submultiple
10^3 kilo (k)	10^{-3} milli (m)
10^6 mega (M)	10^{-6} micro (µ)
10^9 giga (G)	10^{-9} nano (n)
10^{12} tera (T)	10^{-12} pico (p)

TABLE 29. Conversion ratios between energy units.

1) To convert from:	2) Into: TJ	kcal	ktoe	MWh
	3) Multiply by:			
Terajuoule **(TJ)**	1	238,845,897	2.4E-02	277.8
Kilocalorie **(kcal)**	4.1868E-09	1	1E-10	1.16E-06
ktoe	41.868	1E+10	1	11,630
Megawatt-hour **(MWh)**	3.6E-03	859,845	8.6E-05	1

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

I.2. Conversion factors (based on the LHV)

TABLE 30. Conversion factors, constant values in historical series.

toe	unit	value
Asphalts	toe/t	0.964
Sulphur	toe/m³	0.393
Biodiesel	toe/m³	0.831
	toe/t	0.950
Bioethanol	toe/m³	0.507
	toe/t	0.640
Petcoke	toe/t	0.939
Imported petcoke	toe/t	0.800
Coal	toe/t	0.700
Charcoal	toe/t	0.750
Rice husk	toe/t	0.285
Sunflower husk	toe/t	0.380
Barley husk	toe/t	0.371
Coke of coal	toe/t	0.680
Electricity (theoretical equivalent)	toe/MWh	0.086
Fuel gas	toe/10³m³	1.100
Gas natural	toe/10³m³	0.830
Odorous gases	toe/m³	0.240
Firewood	toe/t	0.270
Lubricants	toe/m³	0.909
	toe/t	1.010
Methanol	toe/t	0.360

NOTE: Natural gas: the data are considered under standard conditions (1 atm and 15°C).

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

TABLE 31. Conversion factors, variable values in historical series.

toe	units	2016	2017	2018	2019	2020
Sawdust, chips, forest waste [1]	toe/t	0.222	0.230	0.235	0.276	**0.271**
Bagasse	toe/t	0.177	0.177	0.177	0.177	**0.177**
Biomass for biodiesel [1]	toe/t	0.350	0.316	0.286	0.293	**0.302**
Biomass for bioethanol [1]	toe/t	0.360	0.361	0.356	0.356	**0.359**
Deodorized butane	toe/m³	0.611	0.620	0.612	0.615	**0.612**
	toe/t	1.095	1.096	1.095	1.095	**1.095**
Electricity (thermal equivalent)	toe/MWh	0.248	0.224	0.264	0.143	**0.209**
Medium fuel oil	toe/m³	1.095	0.955	0.929	0.920	**0.919**
	toe/t	1.145	0.973	0.990	0.986	**0.989**
Intermediate fuel oil (IFO) [1]	toe/m³	1.082	0.950	0.943	0.938	**0.927**
	toe/t	1.124	0.976	0.976	0.982	**0.988**
Heavy fuel oil	toe/m³	1.147	0.960	0.958	0.951	**0.940**
	toe/t	1.168	0.966	0.969	0.972	**0.978**
Fuel oil [3]	toe/m³		0.942	0.940	0.931	
	toe/t		0.986	0.984	0.988	
Gas oil (sulphur content < 10 ppm)	toe/m³	0.856	0.857	0.862	0.856	**0.848**
	toe/t	1.026	1.025	1.024	1.026	**1.029**
Gas oil (sulphur content < 50 ppm)	toe/m³	0.871	0.868	0.868	0.863	**0.856**
	toe/t	1.021	1.021	1.022	1.023	**1.026**

toe	units	2016	2017	2018	2019	2020
Marine gas oil	toe/m³	0.887	0.882	0.880	0.880	**0.872**
	toe/t	1.025	1.016	1.016	1.016	**1.019**
Aviation gasoline (Octane number - aviation method: 100)	toe/m³	0.758	0.756	0.755	0.755	**0.754**
	toe/t	1.055	1.055	1.056	1.056	**1.056**
Gasoline (Octane number RON: 97)	toe/m³	0.803	0.800	0.800	0.794	**0.790**
	toe/t	1.043	1.043	1.044	1.045	**1.046**
Gasoline (Octane number RON: 95)	toe/m³	0.792	0.795	0.789	0.785	**0.785**
	toe/t	1.046	1.045	1.047	1.048	**1.048**
Black liquor [1]	toe/t	0.302	0.302	0.302	0.302	**0.302**
Crude oil	toe/m³	0.905	0.880	0.863	0.856	**0.846**
	toe/t	1.059	1.017	1.017	1.023	**1.026**
Propane	toe/m³	0.568	0.568	0.567	0.570	**0.568**
	toe/t	1.099	1.090	1.098	1.098	**1.100**
Kerosene	toe/m³	0.836	0.833	0.830	0.829	**0.829**
	toe/t	1.038	1.033	1.034	1.034	**1.034**
Solvents [1]	toe/m³	0.794	0.803	0.799	0.797	**0.799**
	toe/t	1.044	1.042	1.043	1.044	**1.043**
LP gas	toe/m³	0.601	0.589	0.609	0.615	**0.607**
	toe/t	1.093	1.091	1.092	1.092	**1.092**
Jet fuel	toe/m³	0.844	0.839	0.831	0.829	**0.830**
	toe/t	1.041	1.032	1.034	1.034	**1.034**

NOTE: 1) Weighted average. **2)** Data on gaseous products are estimated (ASTM D3588), under atmospheric pressure conditions and at 15.6°C. **3)** Fuel oil consumed in the free zone, acquired through a supplier other than ANCAP. Conversion factor estimated by MIEM.

Search
Print

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

I.3. CO_2 emission factors

TABLE 32. CO_2 emission factors.

Fuel by Energy Balance	Fuel by IPCC	CO_2 EF (kg/TJ)
Biodiesel	Biodiesel	70,800
Bioethanol	Biogasoline	70,800
Charcoal	Charcoal	112,000
Coke of coal	Coke for coke oven	107,000
Petcoke	Petcoke	97,500
Diesel oil	Gas/Diesel oil	74,100
Fuel oil	Residual fuel oil	77,400
Fuel gas	Refinery gas	57,600
Manufactured gas	Other oil products	73,300
Natural gas	Natural gas	56,100
Gas oil	Gas/Diesel oil	74,100
Firewood	Wood	112,000
Motor gasoline	Motor gasoline	69,300
Aviation gasoline	Aviation gasoline	70,000
Naphta	Naphtha	73,300
Propane	LP gas	63,100
Kerosene	Other kerosene	71,900
Biomass waste	Other primary solid biomass	100,000
Biomass waste	Industrial Waste	143,000
LP gas	LP gas	63,100
Jet fuel	Jet Engine Kerosene	71,500

NOTES: Effective CO_2 emission factor (kg/TJ). Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chart 1.4: “Default CO_2 emission factors for combustion”.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

I.4. Acronyms

TABLE 33. Acronyms.

ADME	Electricity Market Administration
ALUR	Alcohols of Uruguay
ANCAP	National Administration of Fuels, Alcohol, and Portland
BEN	National Energy Balance
CALNU	Limited Agrarian Cooperative of Northern Uruguay
CBU	Central Bank of Uruguay
CO_2	Carbon dioxide
DIEA	Agricultural Statistics Office
DINAMIGE	National Directorate of Mining and Geology
DNE	National Directorate of Energy
EF	CO_2 emission factor
GDP	Gross Domestic Product
Gg	Gigagram
HHV	Higher Heating Value
INAC	National Meat Institute
INE	National Statistics Institute
INGEI	National greenhouse gas inventories
inh.	Inhabitants
IPCC	Intergovernmental Panel on Climate Change
IRES	International Recommendations for Energy Statistics
ISIC	International Standard Industrial Classification
kcal	Kilocalorie
ktoe	Kilotonnes of oil equivalent
kWh	Kilowatt-hour
kWp	Kilowatt peak
LHV	Lower Heating Value
LPG	Liquefied petroleum gas
M$ 2005	Millions of Uruguayan pesos at constant 2005 prices
M$ 2016	Millions of Uruguayan pesos at constant 2016 prices
m^3	Cubic meter
MGAP	Ministry of Livestock, Agriculture and Fisheries
MIEM	Ministry of Industry, Energy and Mining
MW	Megawatt
MWh	Megawatt-hour
NCM	Mercosur Common Nomenclature
OLADE	Latin American Energy Organization
OPYPA	Office of Programming and Agricultural Policy
PEB	Planning, Statistics and Balance Area (at DNE)
ppm	Parts per million
SIN	National Interconnected System
t	Tonne
toe	Tonne of oil equivalent
UTE	National Administration of Power Plants and Electrical Transmissions

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

ANNEX II.
Matrices and Flow Charts

General comments

1. The matrices with their corresponding flow charts are presented for the years: 1965, 1980, 1996, 2001, 2005, 2010, 2015, 2019 and 2020. The complete series of matrices is available on the website: www.ben.miem.gub.uy

2. Energy flows are expressed in ktoe (kilotonnes of oil equivalent).

   1 ktoe = 1,000 toe
   1 toe = 10,000,000 kcal

3. There follows additional information about the denomination of some primary and secon-dary sources included in the matrices:

- **Coal:** It includes anthracite, peat, soft coal tar and pitch.
- **Natural gas:** The data are considered under standard conditions (1 atm and 15 °C).
- **Hydropower:** The theoretical equivalent is considered.
- **Solar energy:** It includes photovoltaic solar energy and solar thermal energy.
- **Biomass waste:** It includes rice and sunflower husk, sugar cane bagasse, black liquor, odorous gases, methanol, barley husk and timber industry's waste.
- **Biomass for biofuels production:** It includes sugar cane, sweet sorghum, soy, sunflower, canola, fat, etc.
- **Industrial waste:** This source includes waste such as end-of-life tires, used oils, glycerin and alternative liquid fuels, formed mainly by hydrocarbons recovered from bilge water and biodiesel industry waste.
- **LPG:** Includes supergas and propane.
- **Motor gasoline:** Bioethanol is not included. It is informed separately. Exports correspond to isomerate, reformate and petrochemical naphtha.
- **Gas oil:** Biodiesel is not included. It is informed separately.
- **Petroleum coke (Petcoke):** It includes scorched and non-scorched petroleum coke, and refinery coke. Until BEN 2012, it was referred to as "other energy products".
- **Non-energy products:** It includes solvents, lubricants, asphalts and liquid sulfur.
- **Coke of coal:** It corresponds to coke of soft coal.
- **Electricity:** The consumption associated with transport as of 2016 includes captive and private fleets.

4. A common matrix format is adopted for all years. In some cases, energy sources and transformation plants are not recorded since they do not correspond to the year being reported.

Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

Special comments

1965

5. **Motor gasoline:** It includes motor gasolines and aviation gasoline.
6. **Kerosene:** It includes kerosene and jet fuel.
7. **Gas oil:** It includes gas oil and diesel oil.
8. **Kerosene, gas oil, fuel oil and manufactured gas:** The commercial/services/public sector's consumptions are included in the residential sector.

2010

9. **Biomass for biofuels, bioethanol and biodiesel:** Biofuels and biomass for production began to be reported.
10. **Biomass waste:** Energy sources such as forest and sawmill residues (sawdust, chips, etc.) are added. The series has been completed since 2008.
11. **Wind energy:** Wind energy used by large wind generators connected to the grid is incorpo-rated into the balance matrix. The series has been completed since 2008.

2015

12. **Power plants for public service and autoproduction plants:** The opening by type of energy source begins to be reported. The series has been completed since 2010, which is available on the website: www.ben.miem.gub.uy
13. **Electricity:** No electricity was imported during 2015. An energy exchange with Argentina was recorded, which corresponds to "return of energy".

2019

14. **Electricity:** In 2019, there was marginal importation of electricity from Brazil in the form of "energy exchange", defined as return energy with no associated cost within the framework of the interconnection agreement.
15. **Coke of coal:** There was neither import nor consumption, therefore, the column of said energy source remains hidden in 2019.

AÑO 2020

16. **Agro sector:** The agriculture sector was subdivided into "poultry farms" and "other agricultural activities.". The series is completed since 2019.
17. **Propane:** An improvement is implemented in the allocation of propane consumption in the different sectors of activity. For this reason, the sectoral consumption of LPG until 2019 has other classification criteria implicit. In the case of the LPG consumption of "other agricultural activities", in 2019 it was estimated from the total value of "agricultural" and the new estimate of consumption in the "poultry " branch. For this reason, the decrease in consumption towards 2020 is due in part to a change in methodology.
18. **Industrial waste:** A new source of primary energy called "industrial waste" is included. The series is completed since 2011.

Ministerio de Industria, Energía y Minería

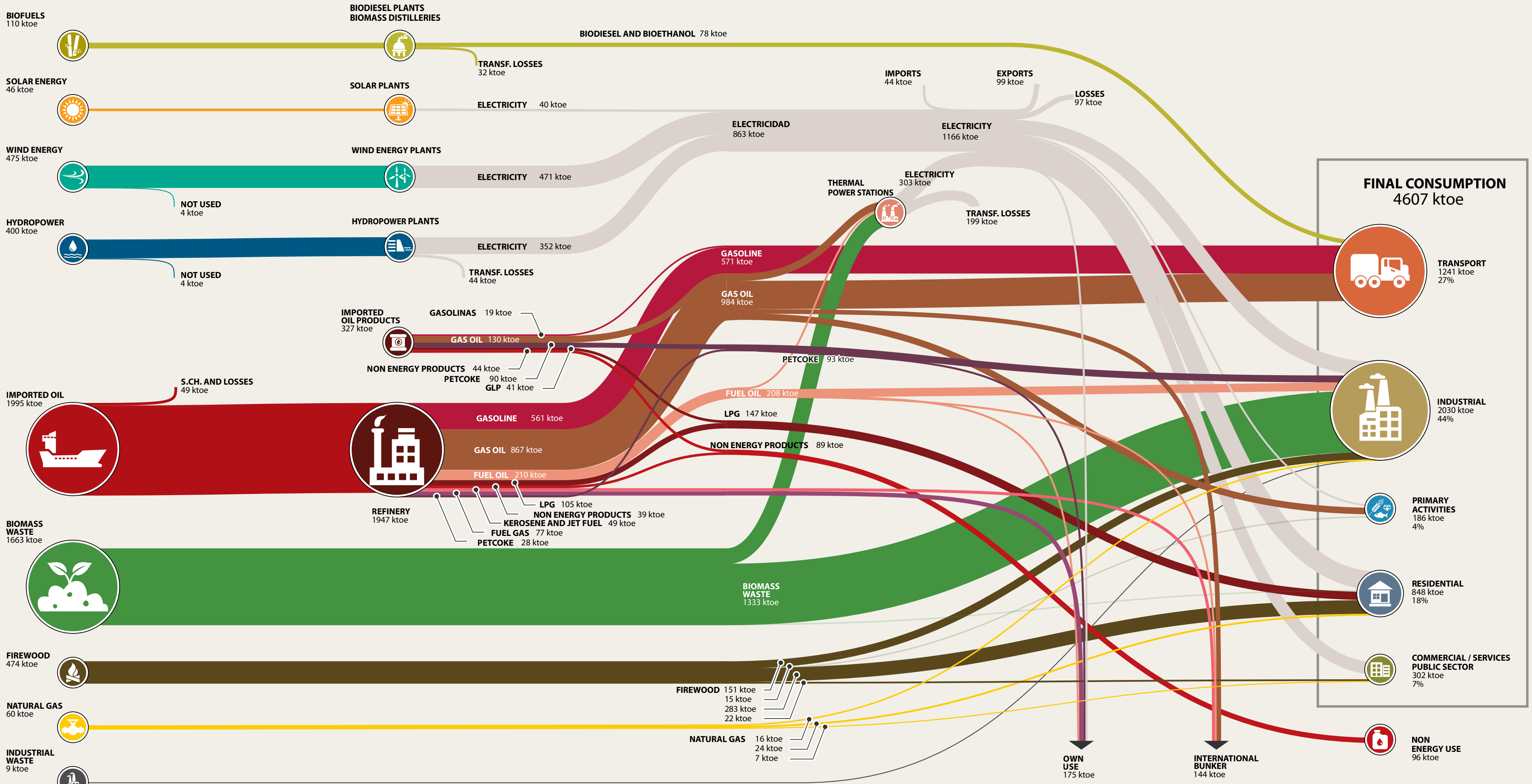
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

2020 (ktoe)	PETRÓLEO	CARBÓN MINERAL	GAS NATURAL	HIDROENERGÍA	EÓLICA	SOLAR	LEÑA	RESIDUOS BIOMASA	BIOCOMBUSTIBLES	RESIDUOS INDUSTRIALES	TOTAL	GLP	GASOLINA AUTOMOTRIZ	GASOLINA AVIACIÓN	QUEROSENO	TURBOCOMBUSTIBLE	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	BIOETANOL	BIODIÉSEL	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	TOTAL	PÉRDIDAS TRANSFORMACIÓN	TOTAL
	Energía primaria											Energía secundaria																	
PRODUCCIÓN				400,1	475,0	45,5	473,5	1.660,9	110,4	9,3	**3.174,7**	104,9	560,7		5,8	43,1	866,7	209,9	28,1	39,2	76,9	39,7	38,3			1.165,9	**3.179,2**		
IMPORTACIÓN	1.995,4	3,7	59,8					1,8			**2.060,7**	41,3	17,5	1,8			129,7		90,3	43,7				0,1	2,6	44,2	**371,2**		
EXPORTACIÓN												-0,9	-5,9							-0,4						-98,7	**-105,9**		
BÚNKER INTERNACIONAL														0,0		-43,8	-85,5	-14,4									**-143,7**		
PÉRDIDAS	-4,6		-0,7								**-5,3**	-1,3		-0,1		-0,9	-0,1	-0,7		0,0		-0,4	-0,2			-97,1	**-100,8**		
VARIACIÓN INVENTARIO	-44,0										**-44,0**	0,8	-2,7	0,0	-0,9	4,1	-12,5	-1,9	-25,0	5,6		1,9	1,1				**-29,5**		
NO UTILIZADA				-3,8	-4,1	-0,1					**-8,0**										-4,3						**-4,3**		
AJUSTES	-0,1		-0,2					0,1			**-0,2**	-0,2	0,1				-0,1		-0,1			0,1	0,1			-0,2	**-0,3**		
OFERTA	1.946,7	3,7	58,9	396,3	470,9	45,4	473,5	1.662,8	110,4	9,3	**5.177,9**	144,6	569,7	1,7	4,9	2,5	898,2	192,9	93,3	88,1	72,6	41,3	39,3	0,1	2,6	1.014,1	**3.165,9**		
REFINERÍAS	-1.946,7										**-1.946,7**	104,9	560,7		5,8	43,1	866,7	209,9	28,1	39,2	76,9						**1.935,3**	-11,4	
CENTRALES ELÉCTRICAS SERV. PÚB.				-396,3	-469,2	-38,0	-0,8	-138,9			**-1.043,2**						-143,2	-26,8								1.017,6	**847,6**	-195,6	
CENTRALES ELÉCTRICAS AUTOPROD.					-1,7	-1,7	-0,8	-190,8			**-195,0**		0,0				-1,2					0,0	-0,1			148,3	**147,0**	-48,0	
DESTILERÍAS DE BIOMASA									-64,4		**-64,4**											39,7					**39,7**	-24,7	
PLANTAS DE BIODIÉSEL									-46,0		**-46,0**												38,3				**38,3**	-7,7	
CENTROS DE TRANSFORMACIÓN	-1.946,7			-396,3	-470,9	-39,7	-1,6	-329,7	-110,4		**-3.295,3**	104,9	560,7		5,8	43,1	722,3	183,1	28,1	39,2	76,9	39,7	38,2			1.165,9	**3.007,9**	-287,4	
OFERTA BRUTA	1.951,3	3,7	59,6	400,1	475,0	45,5	473,5	1.662,8	110,4	9,3	**5.191,2**	145,9	569,7	1,8	4,9	3,4	898,3	193,6	93,3	88,1	76,9	41,7	39,5	0,1	2,6	1.111,2	**3.271,0**		**5.283,0**
CONSUMO NETO TOTAL		3,7	58,9			5,7	471,9	1.333,1		9,3	**1.882,6**	144,6	569,7	1,7	4,9	2,5	753,8	166,1	93,3	88,1	72,6	41,3	39,2	0,1	2,6	1.014,1	**2.994,6**		**4.877,2**
CONSUMO PROPIO			11,7			0,1					**11,8**	1,0	0,1		0,0		0,8	22,2	28,1		72,6	0,0				38,3	**163,1**		**174,9**
CONSUMO FINAL TOTAL		3,7	47,2			5,6	471,9	1.333,1		9,3	**1.870,8**	143,6	569,6	1,7	4,9	2,5	753,0	143,9	65,2	88,1		41,3	39,2	0,1	2,6	975,8	**2.831,5**		**4.702,3**
CONSUMO FINAL NO ENERGÉTICO		3,7									**3,7**		0,1		1,6				0,9	88,1		1,3	0,1				**92,1**		**95,8**
CONSUMO FINAL ENERGÉTICO			47,2			5,6	471,9	1.333,1		9,3	**1.867,1**	143,6	569,5	1,7	3,3	2,5	753,0	143,9	64,3			40,0	39,1	0,1	2,6	975,8	**2.739,4**		**4.606,5**
APERTURA SECTORIAL																													
RESIDENCIAL			23,8			4,7	283,5	7,6			**319,6**	118,1	0,3		3,3		4,5	8,0				0,0	0,2		2,6	391,0	**528,0**		**847,6**
MONTEVIDEO			*21,7*				*55,5*					*54,1*			*0,9*											*155,7*			
INTERIOR			*2,1*				*228,0*	*7,6*				*64,0*			*2,4*											*235,3*			
COMERCIAL/SERVICIOS/SECTOR PÚB.			7,1			0,8	22,1				**30,0**	8,3	0,9		0,0		4,0	6,1				0,1	0,2		0,0	252,6	**272,2**		**302,2**
ALUMBRADO PÚBLICO																										*20,2*			
ADM. PÚBLICA Y DEFENSA							*2,1*					*1,3*					*0,3*	*0,8*								*17,7*			
ELECTRICIDAD, GAS Y AGUA							*0,1*					*0,9*					*0,0*	*0,1*								*15,4*			
RESTO			*7,1*				*19,9*					*6,1*					*3,7*	*5,2*							*0,0*	*199,3*			
TRANSPORTE													565,1	1,0		2,0	601,1	0,1				39,7	31,8			0,2	**1.241,0**		**1.241,0**
CARRETERO													*565,1*				*590,6*					*39,7*	*31,8*			*0,2*	***1.227,4***		***1.227,4***
FERROVIARIO																	*0,2*						*0,0*				***0,2***		***0,2***
AÉREO														*1,0*		*2,0*											***3,0***		***3,0***
MARÍTIMO Y FLUVIAL																	*10,3*	*0,1*									***10,4***		***10,4***
INDUSTRIAL			16,3			0,1	151,3	1.325,5		9,3	**1.502,5**	10,3	0,8				15,6	129,4	64,3			0,1	0,8	0,1		306,1	**527,5**		**2.030,0**
FRIGORÍFICOS			*0,1*				*29,9*	*2,9*				*0,6*					*0,4*	*2,0*								*29,7*			
LÁCTEOS			*0,0*				*33,6*					*1,2*					*0,9*	*15,7*								*17,8*			
MOLINOS			*0,0*				*11,9*	*29,7*				*0,6*					*0,5*	*0,0*								*12,4*			
OTRAS ALIMENTICIAS			*5,3*				*24,9*	*37,6*				*5,2*					*2,2*	*2,1*								*19,9*			
BEBIDAS Y TABACO			*0,1*				*10,4*	*12,7*				*0,3*					*0,9*	*2,5*								*10,2*			
TEXTILES			*0,1*				*5,7*					*0,0*					*0,1*	*0,2*								*2,4*			
CUERO			*0,1*				*4,2*	*0,0*				*0,0*					*0,2*	*0,0*								*2,5*			
MADERA			*0,0*				*1,7*	*129,4*				*0,0*					*1,9*									*9,3*			
PAPEL Y CELULOSA			*1,6*				*13,0*	*1.095,9*				*0,3*					*1,2*	*96,8*								*107,6*			
QUÍMICA, CAUCHO Y PLÁSTICO			*0,8*				*15,8*	*12,5*				*0,9*					*1,1*	*3,8*								*68,0*			
CEMENTO			*1,5*					*4,1*		*9,3*		*0,2*					*1,9*	*0,9*	*64,3*							*6,80*			
OTRAS MANUFACTURERAS Y CONSTRUC.			*6,7*				*0,2*	*0,7*				*1,0*					*4,3*	*5,4*						*0,1*		*19,5*			
ACTIVIDADES PRIMARIAS							15,0				**15,0**	6,9	2,4	0,7	0,0	0,5	127,8	0,3				0,2	6,1			25,9	**170,8**		**185,8**
AGRO							*15,0*				*15,0*	*6,9*		*0,7*		*0,5*	*103,5*	*0,3*					*5,6*			*23,9*	***141,4***		***156,4***
AVÍCOLAS							*1,3*				*1,3*	*4,2*														*2,4*	***6,6***		***7,9***
RESTO AGRO							*13,7*				*13,7*	*2,7*		*0,7*		*0,5*	*103,5*	*0,3*					*5,6*			*21,5*	***134,8***		***148,5***
MINERÍA							*0,0*				*0,0*	*0,0*	*0,0*		*0,0*		*8,9*					*0,0*	*0,5*			*1,5*	***10,9***		***10,9***
PESCA												*0,0*	*2,4*				*15,4*					*0,2*				*0,5*	***18,5***		***18,5***
NO IDENTIFICADO												0,0																	

Start
Table of Contents
Go back

FLOW CHART
2020
(ktoe)

NOTE:
Only main energy flows are represented.



Ministerio de Industria, Energía y Minería

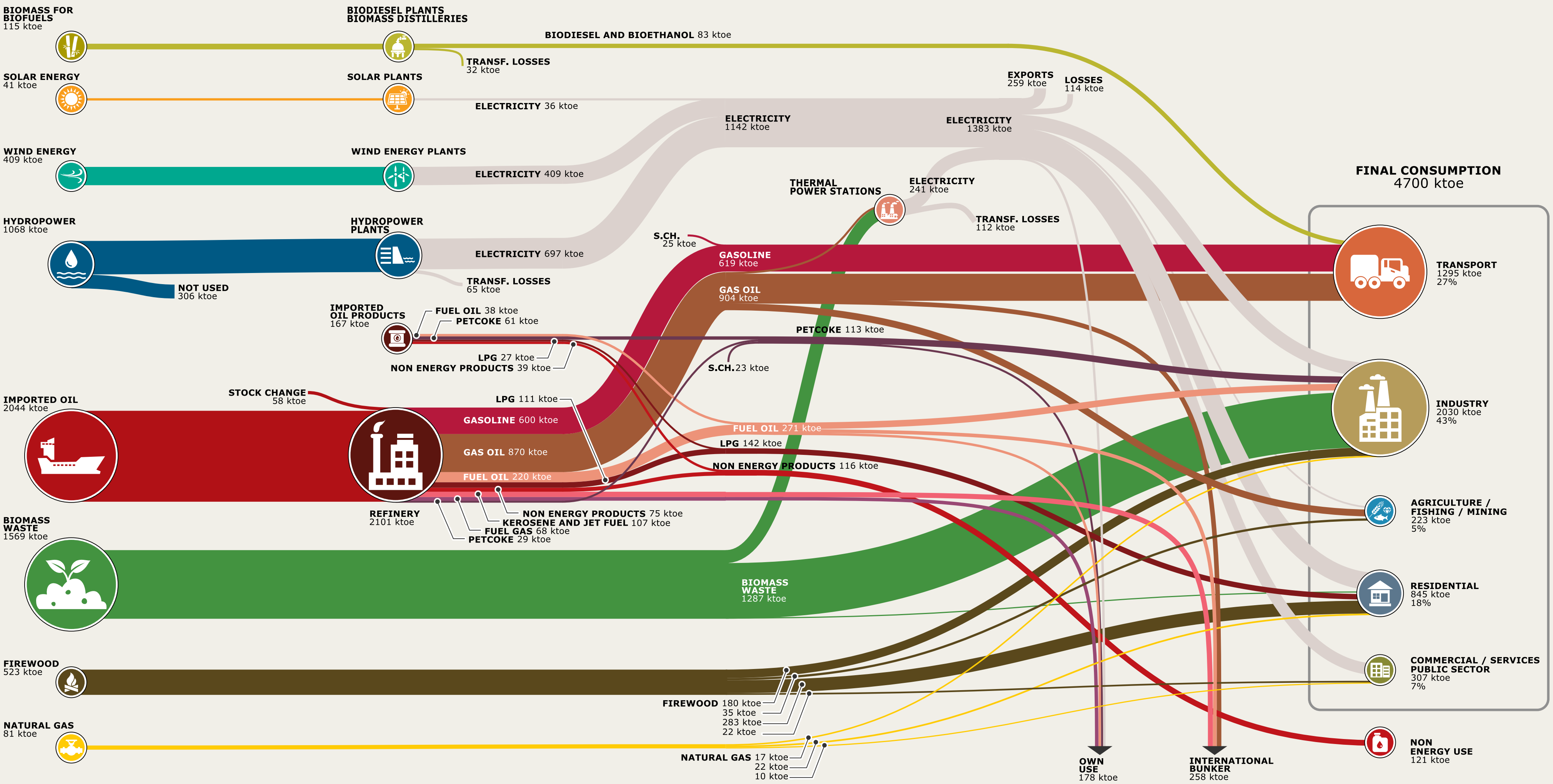
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

2019 (ktoe)	Energía primaria											Energía secundaria																	
	PETRÓLEO	CARBÓN MINERAL	GAS NATURAL	HIDROENERGÍA	EÓLICA	SOLAR	LEÑA	RESIDUOS BIOMASA	BIOCOMBUSTIBLES	RESIDUOS INDUSTRIALES	**TOTAL**	GLP	GASOLINA AUTOMOTRIZ	GASOLINA AVIACIÓN	QUEROSENO	TURBOCOMBUSTIBLE	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	BIOETANOL	BIODIÉSEL	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	**TOTAL**	PÉRDIDAS TRANSFORMACIÓN	**TOTAL**
PRODUCCIÓN				1.068,2	438,4	42,9	502,5	1.569,3	114,6	8,6	**3.744,5**	111,5	599,9		3,8	103,2	869,6	219,8	29,3	74,9	68,1	41,6	41,5			1.383,8	**3.547,0**		
IMPORTACIÓN	2.044,1	3,0	80,8					2,0			**2.129,9**	27,0		1,5				38,5	61,1	38,8				0,1	2,7	0,0	**169,7**		
EXPORTACIÓN												-0,9	-5,8							-0,5		0,0	-0,3			-258,9	**-266,4**		
BÚNKER INTERNACIONAL														0,0		-100,4	-90,4	-67,1									**-257,9**		
PÉRDIDAS	-0,9		-1,2								**-2,1**	-0,3	-1,9	-0,1		-1,0	0,0	-0,3		-0,4		-0,8	-0,6			-113,7	**-119,1**		
VARIACIÓN INVENTARIO	57,9							0,2			**58,1**	3,4	24,8	0,5	1,1	0,6	34,8	12,8	2,8	2,1		-0,9	0,3				**82,3**		
NO UTILIZADA				-306,2	-29,7	-1,7					**-337,6**										-4,5						**-4,5**		
AJUSTES			0,6			0,1		-0,1			**0,6**		0,1	-0,1		0,1	-0,1		0,1								**0,1**		
OFERTA	2.101,1	3,0	80,2	762,0	408,7	41,3	502,5	1.571,4	114,6	8,6	**5.593,4**	140,7	617,1	1,8	4,9	2,5	813,9	203,7	93,3	114,9	63,6	39,9	40,9	0,1	2,7	1.011,2	**3.151,2**		
REFINERÍAS	-2.101,1										**-2.101,1**	111,5	599,9		3,8	103,2	869,6	219,8	29,3	74,9	68,1						**2.080,1**	-21,0	
CENTRALES ELÉCTRICAS SERV. PÚB.			-26,4	-762,0	-407,3	-34,9	-1,0	-98,7			**-1.330,3**						-30,1	-9,8								1.238,9	**1.199,0**	-131,3	
CENTRALES ELÉCTRICAS AUTOPROD.					-1,4	-1,5	-0,8	-185,3			**-189,0**		0,0				-0,8					0,0	0,0			144,9	**144,1**	-44,9	
DESTILERÍAS DE BIOMASA									-66,6		**-66,6**											41,6					**41,6**	-25,0	
PLANTAS DE BIODIÉSEL									-48,0		**-48,0**												41,5				**41,5**	-6,5	
CENTROS DE TRANSFORMACIÓN	-2.101,1		-26,4	-762,0	-408,7	-36,4	-1,8	-284,0	-114,6		**-3.735,0**	111,5	599,9		3,8	103,2	838,7	210,0	29,3	74,9	68,1	41,6	41,5			1.383,8	**3.506,3**	-228,7	
OFERTA BRUTA	2.102,0	3,0	81,4	1.068,2	438,4	43,0	502,5	1.571,4	114,6	8,6	**5.933,1**	141,0	619,0	1,9	4,9	3,5	813,9	204,0	93,3	115,3	68,1	40,7	41,5	0,1	2,7	1.124,9	**3.274,8**		**5.660,9**
CONSUMO NETO TOTAL		3,0	53,8			4,9	500,7	1.287,4		8,6	**1.858,4**	140,7	617,1	1,8	4,9	2,5	783,0	193,9	93,3	114,9	63,6	39,9	40,9	0,1	2,7	1.011,2	**3.110,5**		**4.968,9**
CONSUMO PROPIO			4,1			0,1					**4,2**		0,1		0,0		4,0	39,6	29,3		63,6	0,0				37,5	**174,1**		**178,3**
CONSUMO FINAL TOTAL		3,0	49,7			4,8	500,7	1.287,4		8,6	**1.854,2**	140,7	617,0	1,8	4,9	2,5	779,0	154,3	64,0	114,9		39,9	40,9	0,1	2,7	973,7	**2.936,4**		**4.790,6**
CONSUMO FINAL NO ENERGÉTICO		3,0									**3,0**		0,1		1,6				1,1	114,9		0,3	0,2				**118,2**		**121,2**
CONSUMO FINAL ENERGÉTICO			49,7			4,8	500,7	1.287,4		8,6	**1.851,2**	140,7	616,9	1,8	3,3	2,5	779,0	154,3	62,9			39,6	40,7	0,1	2,7	973,7	**2.818,2**		**4.669,4**
APERTURA SECTORIAL: **RESIDENCIAL**			22,2			4,0	283,5	7,6			**317,3**	109,4	0,4		3,2		4,6	9,7				0,0	0,2		2,7	377,4	**507,6**		**824,9**
MONTEVIDEO			*20,2*				*55,5*					*50,1*			*0,9*											*152,9*			
INTERIOR			*2,0*				*228,0*	*7,6*				*59,3*			*2,3*											*224,5*			
COMERCIAL/SERVICIOS/SECTOR PÚB.			10,0			0,7	22,1				**32,8**	7,2	1,1		0,1		4,9	8,9				0,1	0,3		0,0	261,0	**283,6**		**316,4**
ALUMBRADO PÚBLICO																										*21,0*			
ADM. PÚBLICA Y DEFENSA							*2,1*					*0,9*					*0,9*	*1,3*								*18,3*			
ELECTRICIDAD, GAS Y AGUA							*0,1*					*0,0*					*0,0*	*0,1*								*10,5*			
RESTO			*10,0*				*19,9*					*6,3*					*4,0*	*7,5*							*0,0*	*211,2*			
TRANSPORTE													612,7	1,0		2,1	628,2					39,4	33,4			0,1	**1.316,9**		**1.316,9**
CARRETERO													*612,7*				*615,4*					*39,4*	*33,4*			*0,1*	***1.301,0***		***1.301,0***
FERROVIARIO																	*0,7*						*0,0*				***0,7***		***0,7***
AÉREO														*1,0*		*2,1*											***3,1***		***3,1***
MARÍTIMO Y FLUVIAL																	*12,1*										***12,1***		***12,1***
INDUSTRIAL			17,5			0,1	180,1	1.279,8		8,6	**1.486,1**	15,9	0,5				16,5	135,5	62,9			0,0	0,9	0,1		311,5	**543,8**		**2.029,9**
FRIGORÍFICOS			*0,2*				*39,1*	*5,1*				*0,7*					*1,3*	*3,5*								*28,3*			
LÁCTEOS			*0,0*				*20,9*					*2,9*					*0,2*	*17,0*								*14,4*			
MOLINOS			*0,0*				*16,9*	*30,8*				*0,4*					*0,7*									*10,0*			
OTRAS ALIMENTICIAS			*5,7*				*28,4*	*26,3*				*4,9*					*3,6*	*1,6*								*20,2*			
BEBIDAS Y TABACO			*0,1*				*11,9*	*12,5*				*1,6*					*0,3*	*0,6*								*11,1*			
TEXTILES			*0,1*				*9,8*					*0,0*					*0,3*	*0,5*								*2,7*			
CUERO			*0,6*				*8,9*					*0,0*					*0,3*	*0,2*								*3,7*			
MADERA			*0,0*				*2,2*	*116,1*				*0,5*					*2,7*									*14,8*			
PAPEL Y CELULOSA			*2,1*				*16,2*	*1.076,8*				*0,3*					*1,2*	*100,0*								*105,0*			
QUÍMICA, CAUCHO Y PLÁSTICO			*0,9*				*22,6*	*9,5*				*1,9*					*1,0*	*3,6*								*71,8*			
CEMENTO			*1,7*				*2,1*	*2,7*		*8,6*		*0,2*					*1,2*	*0,7*	*62,9*							*10,40*			
OTRAS MANUFACTURERAS Y CONSTRUC.			*6,1*				*1,1*	*0,0*				*2,5*					*3,7*	*7,8*						*0,1*		*19,1*			
ACTIVIDADES PRIMARIAS							15,0				**15,0**	8,2	2,2	0,8	0,0	0,4	124,8	0,2				0,1	5,9			23,7	**166,3**		**181,3**
AGRO							*15,0*				***15,0***	*8,2*		*0,8*		*0,4*	*103,5*	*0,2*					*5,6*			*21,7*	***140,4***		***155,4***
AVÍCOLAS							*1,3*				***1,3***	*4,2*														*2,9*	***7,1***		***8,4***
RESTO AGRO							*13,7*				***13,7***	*4,0*		*0,8*		*0,4*	*103,5*	*0,2*					*5,6*			*18,8*	***133,3***		***147,0***
MINERÍA							*0,0*				***0,0***	*0,0*	*0,0*		*0,0*		*5,5*					*0,0*	*0,3*			*1,5*	***7,3***		***7,3***
PESCA													*2,2*				*15,8*					*0,1*				*0,5*	***18,6***		***18,6***
NO IDENTIFICADO																													

Start
Table of Contents
Go back

FLOW CHART
2019
(ktoe)

NOTES:
1) Only main energy flows are represented.
2) This flow chart is the original version and does not include the corrections made later on.



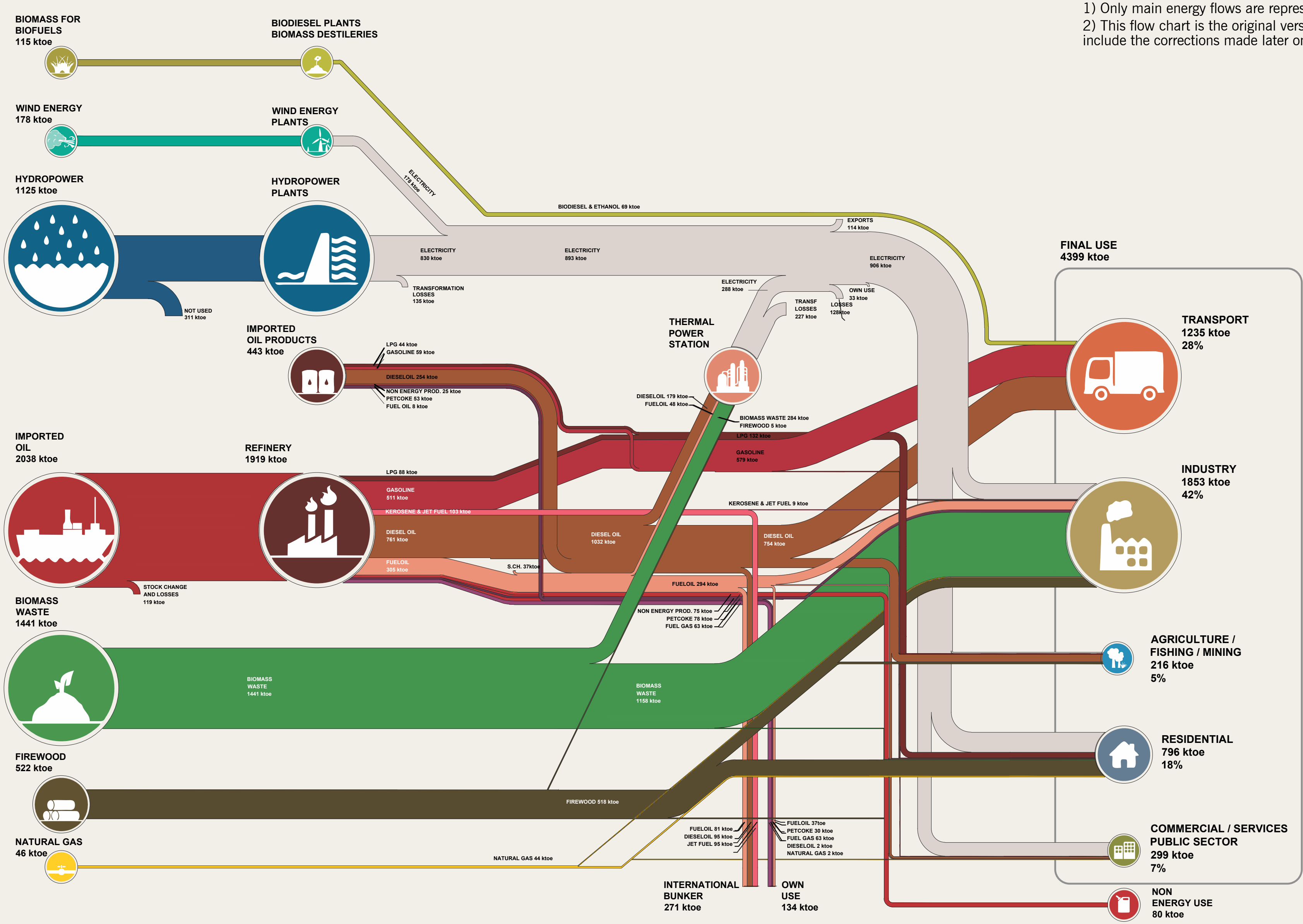
Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

2015 (ktoe)	▼ Energía primaria											▼ Energía secundaria																
	PETRÓLEO	CARBÓN MINERAL	GAS NATURAL	HIDROENERGÍA	EÓLICA	SOLAR	LEÑA	RESIDUOS BIOMASA	BIOCOMBUSTIBLES	RESIDUOS INDUSTRIALES	**TOTAL**	GLP	GASOLINA AUTOMOTRIZ	GASOLINA AVIACIÓN	QUEROSENO	TURBOCOMBUSTIBLE	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	BIOETANOL	BIODIÉSEL	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	**TOTAL**	PÉRDIDAS TRANSFORMACIÓN	**TOTAL**
PRODUCCIÓN				1.124,6	177,6	7,1	522,3	1.441,4	115,3	6,0	**3.394,3**	87,6	492,9		6,1	97,3	760,7	304,6	29,9	50,8	67,3	36,2	47,8			1.180,9	**3.162,1**		
IMPORTACIÓN	2.037,6	2,3	45,8								**2.085,7**	43,7	55,9	3,0			254,0	8,1	53,2	24,5				0,1	1,5	0,2	**444,2**		
EXPORTACIÓN																				-0,2		-0,1	-0,1			-113,6	**-114,0**		
BÚNKER INTERNACIONAL														-0,1		-95,3	-95,3	-81,3									**-272,0**		
PÉRDIDAS	-1,5		0,0								**-1,5**	-1,0	-0,2	-0,1	-0,2	-0,3	-4,1	-7,0		-0,2		-0,6				-128,1	**-141,8**		
VARIACIÓN INVENTARIO	-117,5										**-117,5**	0,5	9,4	-0,4	0,2	0,9	17,3	36,9	-5,6	0,4		-4,6	0,0				**55,0**		
NO UTILIZADA				-310,6							**-310,6**										-4,1						**-4,1**		
AJUSTES	0,1		-0,1									0,1	0,2	0,1		0,1	0,1					0,1	0,1			-0,1	**0,7**		
OFERTA	1.918,7	2,3	45,7	814,0	177,6	7,1	522,3	1.441,4	115,3	6,0	**5.050,4**	130,9	558,2	2,5	6,1	2,7	932,7	261,3	77,5	75,3	63,2	31,0	47,8	0,1	1,5	939,3	**3.130,1**		
REFINERÍAS	-1.918,7										**-1.918,7**	87,6	492,9		6,1	97,3	760,7	304,6	29,9	50,8	67,3						**1.897,2**	-21,5	
CENTRALES ELÉCTRICAS SERV. PÚB.			0,0	-814,0	-177,0	-4,0	-2,7	-107,3			**-1.105,0**						-178,3	-45,4								1.043,0	**819,3**	-285,7	
CENTRALES ELÉCTRICAS AUTOPROD.					-0,6	-0,2	-2,1	-176,5			**-179,4**						-0,6	-2,1					0,0			137,9	**135,2**	-44,2	
DESTILERÍAS DE BIOMASA									-55,1		**-55,1**											36,2					**36,2**	-18,9	
PLANTAS DE BIODIÉSEL									-60,2		**-60,2**												47,8				**47,8**	-12,4	
CENTROS DE TRANSFORMACIÓN	-1.918,7		0,0	-814,0	-177,6	-4,2	-4,8	-283,8	-115,3		**-3.318,4**	87,6	492,9		6,1	97,3	581,8	257,1	29,9	50,8	67,3	36,2	47,8			1.180,9	**2.935,7**	-382,7	
OFERTA BRUTA	1.920,2	2,3	45,7	1.124,6	177,6	7,1	522,3	1.441,4	115,3	6,0	**5.362,5**	131,9	558,4	2,6	6,3	3,0	936,8	268,3	77,5	75,5	67,3	31,6	47,8	0,1	1,5	1.067,4	**3.276,0**		**5.476,4**
CONSUMO NETO TOTAL		2,3	45,7			2,9	517,5	1.157,6		6,0	**1.732,0**	130,9	558,2	2,5	6,1	2,7	753,8	213,8	77,5	75,3	63,2	31,0	47,8	0,1	1,5	939,3	**2.903,7**		**4.635,7**
CONSUMO PROPIO			2,0			0,1					**2,1**	0,8	0,1				1,9	37,3	29,9	0,0	63,2					33,1	**166,3**		**168,4**
CONSUMO FINAL TOTAL		2,3	43,7			2,8	517,5	1.157,6		6,0	**1.729,9**	130,1	558,1	2,5	6,1	2,7	751,9	176,5	47,6	75,3		31,0	47,8	0,1	1,5	906,2	**2.737,4**		**4.467,3**
CONSUMO FINAL NO ENERGÉTICO		2,3									**2,3**		0,1		1,7			0,7	0,6	75,3							**78,4**		**80,7**
CONSUMO FINAL ENERGÉTICO			43,7			2,8	517,5	1.157,6		6,0	**1.727,6**	130,1	558,0	2,5	4,4	2,7	751,9	175,8	47,0			31,0	47,8	0,1	1,5	906,2	**2.659,0**		**4.386,6**
APERTURA SECTORIAL ▸																													
RESIDENCIAL			21,2			2,4	283,5	7,6			**314,7**	101,6	0,3		4,3		4,5	12,0				0,0	0,3		1,5	357,0	**481,5**		**796,2**
MONTEVIDEO			*19,2*				*55,5*					*46,6*			*1,3*											*148,7*			
INTERIOR			*2,0*				*228,0*	*7,6*				*55,0*			*3,0*											*208,3*			
COMERCIAL/SERVICIOS/SECTOR PÚB.			10,8			0,4	22,1				**33,3**	5,8	0,9		0,1		5,8	6,6				0,0	0,4		0,0	246,3	**265,9**		**299,2**
ALUMBRADO PÚBLICO																										*21,9*			
ADM. PÚBLICA Y DEFENSA							*2,1*					*0,7*					*1,7*	*1,4*								*17,2*			
ELECTRICIDAD, GAS Y AGUA							*0,1*					*0,0*					*0,0*	*0,1*								*8,6*			
RESTO			*10,8*				*19,9*					*5,1*					*4,1*	*5,1*							*0,0*	*198,6*			
TRANSPORTE													550,7	2,5		2,7	590,8	0,8				30,8	38,1				**1.216,4**		**1.216,4**
CARRETERO													*550,7*				*573,0*					*30,8*	*38,0*				***1.192,5***		***1.192,5***
FERROVIARIO																	*1,7*						*0,1*				***1,8***		***1,8***
AÉREO														*2,5*		*2,7*											***5,2***		***5,2***
MARÍTIMO Y FLUVIAL																	*16,1*	*0,8*									***16,9***		***16,9***
INDUSTRIAL			11,7			0,0	176,9	1.150,0		6,0	**1.344,6**	17,3	0,3				14,9	154,8	47,0			0,0	1,0	0,1		279,5	**514,9**		**1.859,5**
FRIGORÍFICOS			*0,2*				*42,0*	*1,4*				*0,7*					*0,7*	*5,7*								*23,8*			
LÁCTEOS			*0,9*				*24,6*					*0,9*					*0,4*	*17,2*								*13,9*			
MOLINOS			*0,0*				*17,4*	*33,8*				*0,4*					*0,3*									*9,3*			
OTRAS ALIMENTICIAS			*4,7*				*27,3*	*40,4*				*5,7*					*2,4*	*2,3*								*18,3*			
BEBIDAS Y TABACO			*0,1*				*16,3*	*4,4*				*0,6*					*0,3*	*3,8*								*8,9*			
TEXTILES			*0,2*				*4,6*					*0,1*					*0,2*	*1,5*								*3,5*			
CUERO			*0,6*				*7,1*					*0,0*					*0,2*	*0,7*								*3,8*			
MADERA			*0,0*				*0,4*	*84,1*				*0,2*					*1,2*									*8,5*			
PAPEL Y CELULOSA			*1,0*				*26,7*	*979,6*				*2,6*					*1,6*	*90,9*								*94,6*			
QUÍMICA, CAUCHO Y PLÁSTICO			*1,1*				*4,4*	*0,0*				*0,9*					*0,7*	*6,4*								*66,9*			
CEMENTO			*2,5*				*5,0*	*4,9*		*6,0*		*0,0*					*1,3*	*19,0*	*47,0*							*9,90*			
OTRAS MANUFACTURERAS Y CONSTRUC.			*0,4*				*1,1*	*1,4*				*5,2*					*5,6*	*7,3*						*0,1*		*18,1*			
ACTIVIDADES PRIMARIAS							35,0				**35,0**	5,4	5,8				135,9	1,6				0,2	8,0			23,4	**180,3**		**215,3**
AGRO							*35,0*				*35,0*	*5,2*	*3,6*				*110,5*	*0,7*				*0,1*	*7,3*			*17,8*	***145,2***		***180,2***
AVÍCOLAS																													
RESTO AGRO																													
MINERÍA												*0,2*	*0,1*				*11,2*					*0,0*	*0,7*			*5,1*	***17,3***		***17,3***
PESCA													*2,1*				*14,2*	*0,9*				*0,1*				*0,5*	***17,8***		***17,8***
NO IDENTIFICADO																													

FLOW CHART
2015
(ktoe)

NOTES:
1) Only main energy flows are represented.
2) This flow chart is the original version and does not include the corrections made later on.



Search
Print

Ministerio de Industria, Energía y Minería

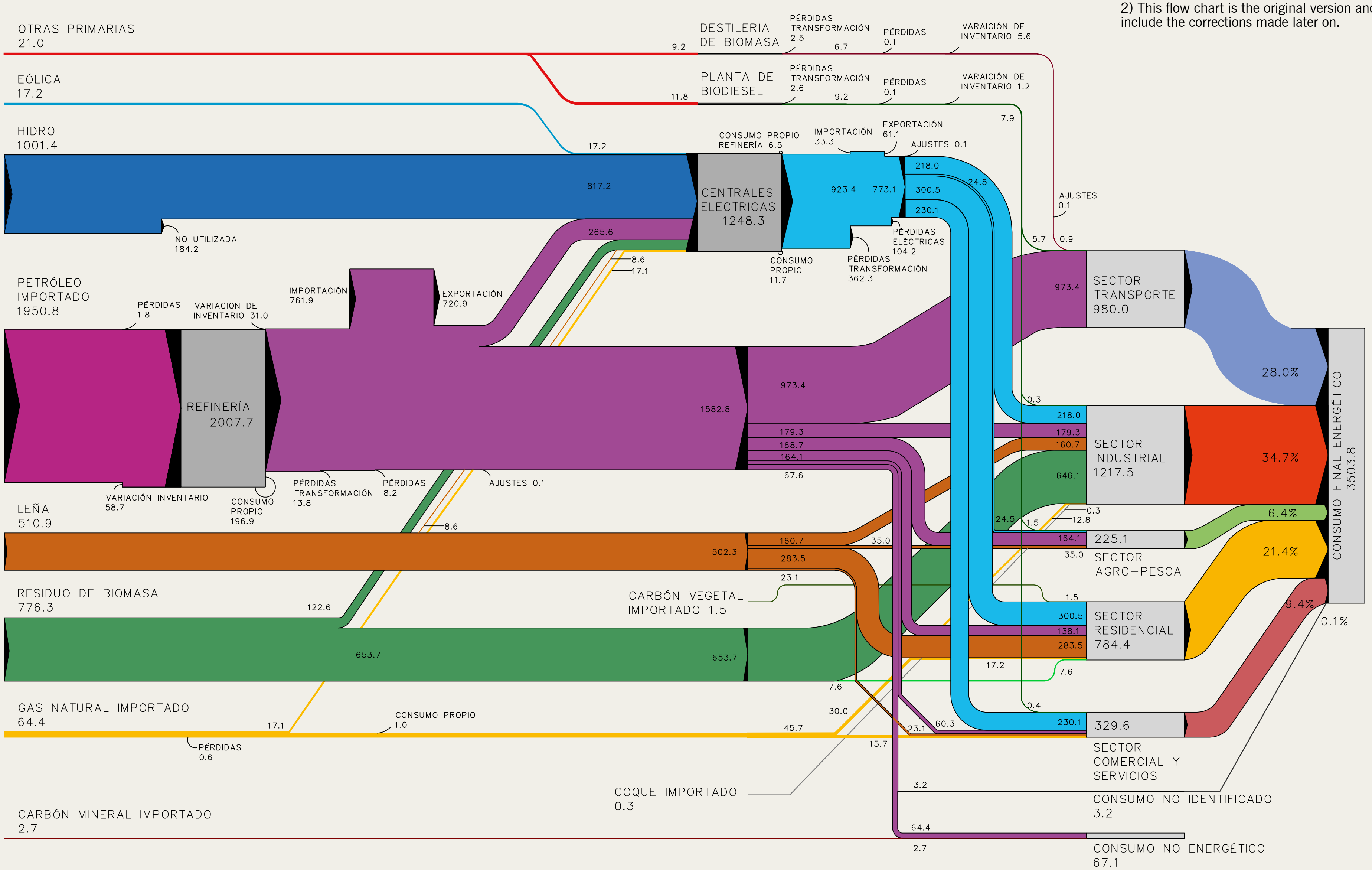
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

2010 (ktoe)	▼ Energía primaria									▼ Energía secundaria																		
	PETRÓLEO	CARBÓN MINERAL	GAS NATURAL	HIDROENERGÍA	EÓLICA	LEÑA	RESIDUOS BIOMASA	BIOCOMBUSTIBLES	**TOTAL**	GLP	GASOLINA AUTOMOTRIZ	GASOLINA AVIACIÓN	QUEROSENO	TURBOCOMBUSTIBLE	DIÉSEL OIL	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	BIOETANOL	BIODIÉSEL	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	**TOTAL**	PÉRDIDAS TRANSFORMACIÓN	**TOTAL**
PRODUCCIÓN				1,001.4	6.0	531.3	766.7	20.8	**2,326.2**	77.1	447.3		8.6	76.4	5.3	713.9	448.7	22.8	41.9	58.1	6.7	9.2			923.0	**2,839.0**		
IMPORTACIÓN	1,950.9	1.3	64.4						**2,016.6**	59.5	122.1	3.8		4.2		326.5	177.6	48.6	19.5				0.3	1.5	33.3	**796.9**		
EXPORTACIÓN										-8.5	-188.9	-0.2		-76.6	-1.8	-111.2	-333.6		-0.1						-61.1	**-782.0**		
PÉRDIDAS	-1.8		-0.6						**-2.4**	-2.4	-1.3	-0.1	-0.1			-0.5	-0.5		-3.3		-0.1	-0.1			-104.2	**-112.6**		
VARIACIÓN INVENTARIO	-43.7								**-43.7**	-1.5	17.0	-0.9	-0.4	-2.3	-2.1	7.2	25.3	-16.0	4.7		-5.6	-1.2				**24.2**		
NO UTILIZADA				-184.2					**-184.2**																			
AJUSTES																			0.1		-0.1				-0.1	**-0.1**		
OFERTA	1,905.4	1.3	63.8	817.2	6.0	531.3	766.7	20.8	**4,112.5**	124.2	396.2	2.6	8.1	1.7	1.4	935.9	317.5	55.4	62.8	58.1	0.9	7.9	0.3	1.5	790.9	**2,765.4**		
REFINERÍAS	-1,905.4								**-1,905.4**	77.1	447.3		8.6	76.4	5.3	713.9	448.7	22.8	41.9	58.1						**1,900.1**	-5.3	
CENTRALES ELÉCTRICAS SERV, PÚB,			-16.9	-817.2	-6.0	-7.0	-30.7		**-877.8**							-119.2	-142.9								851.7	**589.6**	-288.2	
CENTRALES ELÉCTRICAS AUTOPROD,			-0.2			-1.6	-90.4		**-92.2**							-0.5	-0.4					0.0			71.3	**70.4**	-21.8	
DESTILERÍAS DE BIOMASA								-9.0	**-9.0**												6.7					**6.7**	-2.3	
PLANTAS DE BIODIÉSEL								-11.8	**-11.8**													9.2				**9.2**	-2.6	
CENTROS DE TRANSFORMACIÓN	-1,905.4		-17.1	-817.2	-6.0	-8.6	-121.1	-20.8	**-2,896.2**	77.1	447.3		8.6	76.4	5.3	594.2	305.4	22.8	41.9	58.1	6.7	9.2			923.0	**2,576.0**	-320.2	
OFERTA BRUTA	1,907.2	1.3	64.4	1,001.4	6.0	531.3	766.7	20.8	**4,299.1**	126.6	397.5	2.7	8.2	1.7	1.4	936.4	318.0	55.4	66.1	58.1	1.0	8.0	0.3	1.5	895.1	**2,878.0**		**4,338.1**
CONSUMO NETO TOTAL		1.3	46.7			522.7	645.6		**1,216.3**	124.2	396.2	2.6	8.1	1.7	1.4	816.2	174.2	55.4	62.8	58.1	0.9	7.9	0.3	1.5	790.9	**2,502.4**		**3,718.7**
CONSUMO PROPIO			1.0						**1.0**		0.1					0.7	34.3	22.8		58.1					18.2	**134.2**		**135.2**
CONSUMO FINAL TOTAL		1.3	45.7			522.7	645.6		**1,215.3**	124.2	396.1	2.6	8.1	1.7	1.4	815.5	139.9	32.6	62.8		0.9	7.9	0.3	1.5	772.7	**2,368.2**		**3,583.5**
CONSUMO FINAL NO ENERGÉTICO		1.3							**1.3**		0.2		1.3					0.1	62.8							**64.4**		**65.7**
CONSUMO FINAL ENERGÉTICO			45.7			522.7	645.6		**1,214.0**	124.2	395.9	2.6	6.8	1.7	1.4	815.5	139.9	32.5			0.9	7.9	0.3	1.5	772.7	**2,303.8**		**3,517.8**
SECTORES ▶ RESIDENCIAL			17.2			283.5	7.6		**308.3**	105.7	0.2		6.7		0.6	4.9	27.3				0.0	0.0		1.5	300.5	**447.4**		**755.7**
COMERCIAL/SERVICIOS/SECTOR PÚB,			15.7			23.1			**38.8**	5.7	0.6		0.1		0.2	8.3	7.7				0.0	0.1			230.1	**252.8**		**291.6**
TRANSPORTE											389.6	2.6		1.7	0.5	629.8	0.9				0.9	6.3				**1,032.3**		**1,032.3**
INDUSTRIAL			12.8			181.1	638.0		**831.9**	12.8	0.3				0.1	14.9	103.1	32.5			0.0	0.2	0.3		217.6	**381.8**		**1,213.7**
ACTIVIDADES PRIMARIAS						35.0			**35.0**		5.2					157.6	0.9				0.0	1.3			24.5	**189.5**		**224.5**
NO IDENTIFICADO											0.0										0.0					**0.0**		**0.0**

Start
Table of Contents
Go back

FLOW CHART
2010
(ktoe)

NOTES:
1) Only main energy flows are represented.
2) This flow chart is the original version and does not include the corrections made later on.



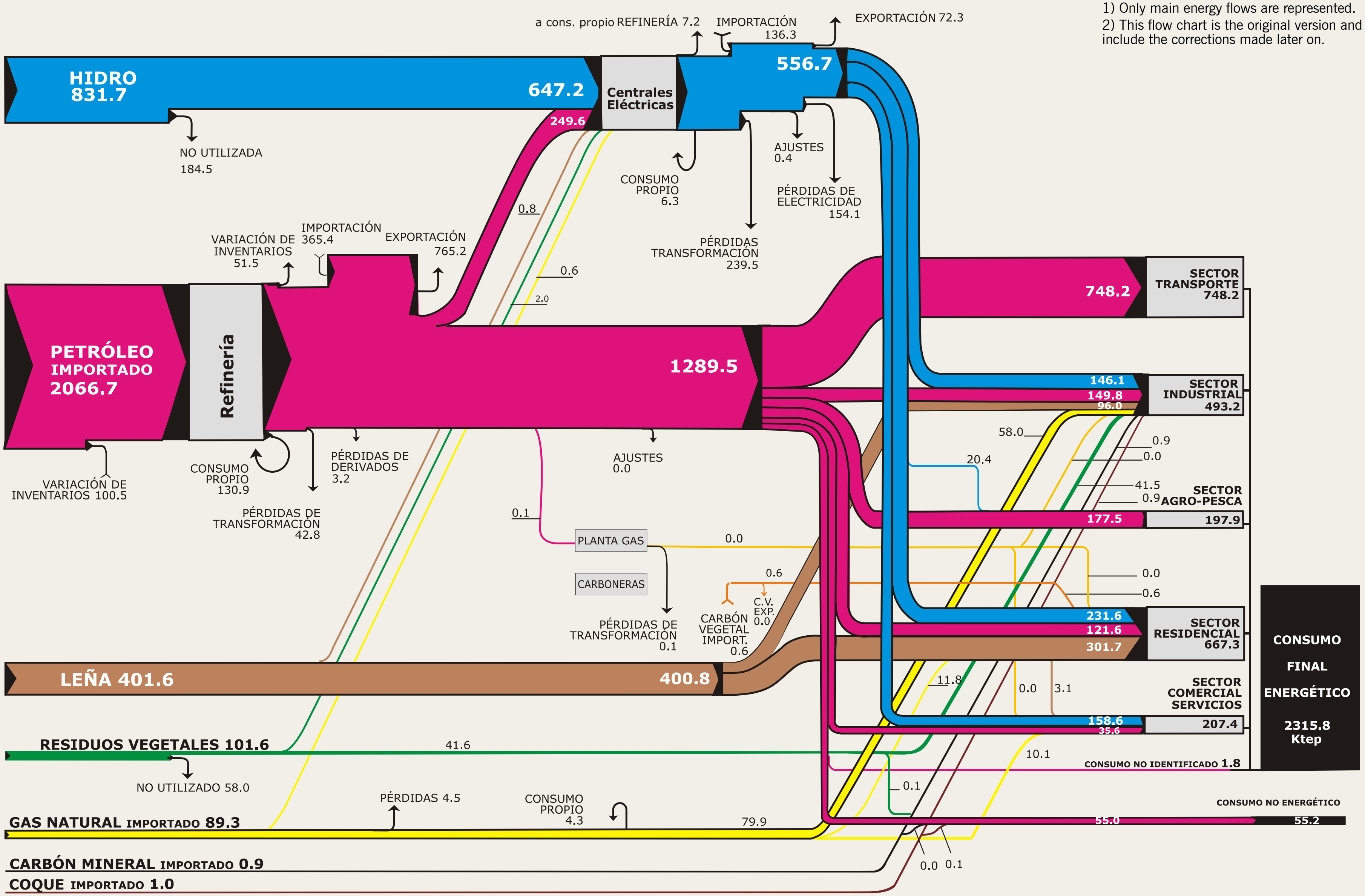
Ministerio **de Industria, Energía y Minería**

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

	2005 (ktoe)	Energía primaria							Energía secundaria																		
		PETRÓLEO	CARBÓN MINERAL	GAS NATURAL	HIDROENERGÍA	LEÑA	RESIDUOS BIOMASA	**TOTAL**	GLP	GASOLINA AUTOMOTRIZ	NAFTA LIVIANA	GASOLINA AVIACIÓN	QUEROSENO	TURBOCOMBUSTIBLE	DIÉSEL OIL	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	GAS MANUFACTURADO	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	**TOTAL**	PÉRDIDAS TRANSFORMACIÓN	**TOTAL**
	PRODUCCIÓN				831.7	444.7	101.6	**1,378.0**	99.4	469.4		0.2	9.2	42.7	16.4	809.5	486.8	29.7	12.6	72.6	0.0			660.7	**2,709.2**		
	IMPORTACIÓN	2,066.7	0.9	89.3				**2,156.9**	2.5	76.1		2.0				139.6	100.5	0.6	44.1			1.0	0.6	136.3	**503.3**		
	EXPORTACIÓN								-6.8	-311.0				-42.2	-13.1	-126.7	-264.8		-0.6				0.0	-72.3	**-837.5**		
	PÉRDIDAS			-10.9				**-10.9**	-0.2	-0.7	0.0	0.0		0.0			-1.7		-0.6					-154.1	**-157.3**		
	VARIACIÓN INVENTARIO	100.7						**100.7**	1.7	-9.6	0.1	0.0	-0.4	1.0	-1.9	-3.4	15.4	23.1	-1.3						**24.7**		
	NO UTILIZADA				-184.5		-58.0	**-242.5**																			
	AJUSTES													-0.1										-0.4	**-0.5**		
	OFERTA	2,167.4	0.9	78.4	647.2	444.7	43.6	**3,382.2**	96.6	224.2	0.1	2.2	8.8	1.4	1.4	819.0	336.2	53.4	54.2	72.6	0.0	1.0	0.6	570.2	**2,241.9**		
	REFINERÍAS	-2,167.4						**-2,167.4**	99.4	469.4		0.2	9.2	42.7	16.4	809.5	486.8	29.7	12.6	72.6					**2,048.5**	-118.9	
	CENTRALES ELÉCTRICAS SERV, PÚB,				-647.2			**-647.2**								-84.0	-165.0							657.1	**408.1**	-239.1	
	CENTRALES ELÉCTRICAS AUTOPROD,			-0.6		-0.8	-2.0	**-3.4**								-0.3	-0.3							3.6	**3.0**	-0.4	
	PLANTAS DE GAS										-0.1										0.0				**-0.1**	-0.1	
	CENTROS DE TRANSFORMACIÓN	-2,167.4		-0.6	-647.2	-0.8	-2.0	**-2,818.0**	99.4	469.4	-0.1	0.2	9.2	42.7	16.4	725.2	321.5	29.7	12.6	72.6	0.0			660.7	**2,459.5**	-358.5	
	OFERTA BRUTA	2,167.4	0.9	89.3	831.7	444.7	101.6	**3,635.6**	96.8	224.9	0.1	2.2	8.8	1.4	1.4	819.0	337.9	53.4	54.8	72.6	0.0	1.0	0.6	724.3	**2,399.2**		**3,325.6**
	CONSUMO NETO TOTAL		0.9	77.8		443.9	41.6	**564.2**	96.6	224.2		2.2	8.8	1.4	1.4	734.7	170.9	53.4	54.2	72.6	0.0	1.0	0.6	570.2	**1,992.2**		**2,556.4**
	CONSUMO PROPIO			4.3				**4.3**		0.0			0.0			1.3	27.3	29.7		72.6				13.5	**144.4**		**148.7**
	CONSUMO FINAL TOTAL		0.9	73.5		443.9	41.6	**559.9**	96.6	224.2		2.2	8.8	1.4	1.4	733.4	143.6	23.7	54.2		0.0	1.0	0.6	556.7	**1,847.8**		**2,407.7**
	CONSUMO FINAL NO ENERGÉTICO		0.0				0.1	**0.1**	0.0	0.2			0.4			0.2			54.2			0.1			**55.1**		**55.2**
	CONSUMO FINAL ENERGÉTICO		0.9	73.5		443.9	41.5	**559.8**	96.6	224.0		2.2	8.4	1.4	1.4	733.2	143.6	23.7			0.0	0.9	0.6	556.7	**1,792.7**		**2,352.5**
SECTORES	RESIDENCIAL			11.8		301.7		**313.5**	88.7				7.4		0.8	0.1	24.6				0.0		0.6	231.6	**353.8**		**667.3**
	COMERCIAL/SERVICIOS/SECTOR PÚB,			10.1		3.1		**13.2**	2.8				0.1		0.3	25.1	7.3				0.0			158.6	**194.2**		**207.4**
	TRANSPORTE									214.6		2.2		1.4	0.1	529.9									**748.2**		**748.2**
	INDUSTRIAL		0.9	51.6		139.1	41.5	**233.1**	5.1	0.2			0.9		0.2	8.0	111.7	23.7			0.0	0.9		146.1	**296.8**		**529.9**
	ACTIVIDADES PRIMARIAS									7.4						170.1								20.4	**197.9**		**197.9**
	NO IDENTIFICADO									1.8															**1.8**		**1.8**

FLOW CHART
2005
(ktoe)

NOTES:
1) Only main energy flows are represented.
2) This flow chart is the original version and does not include the corrections made later on.



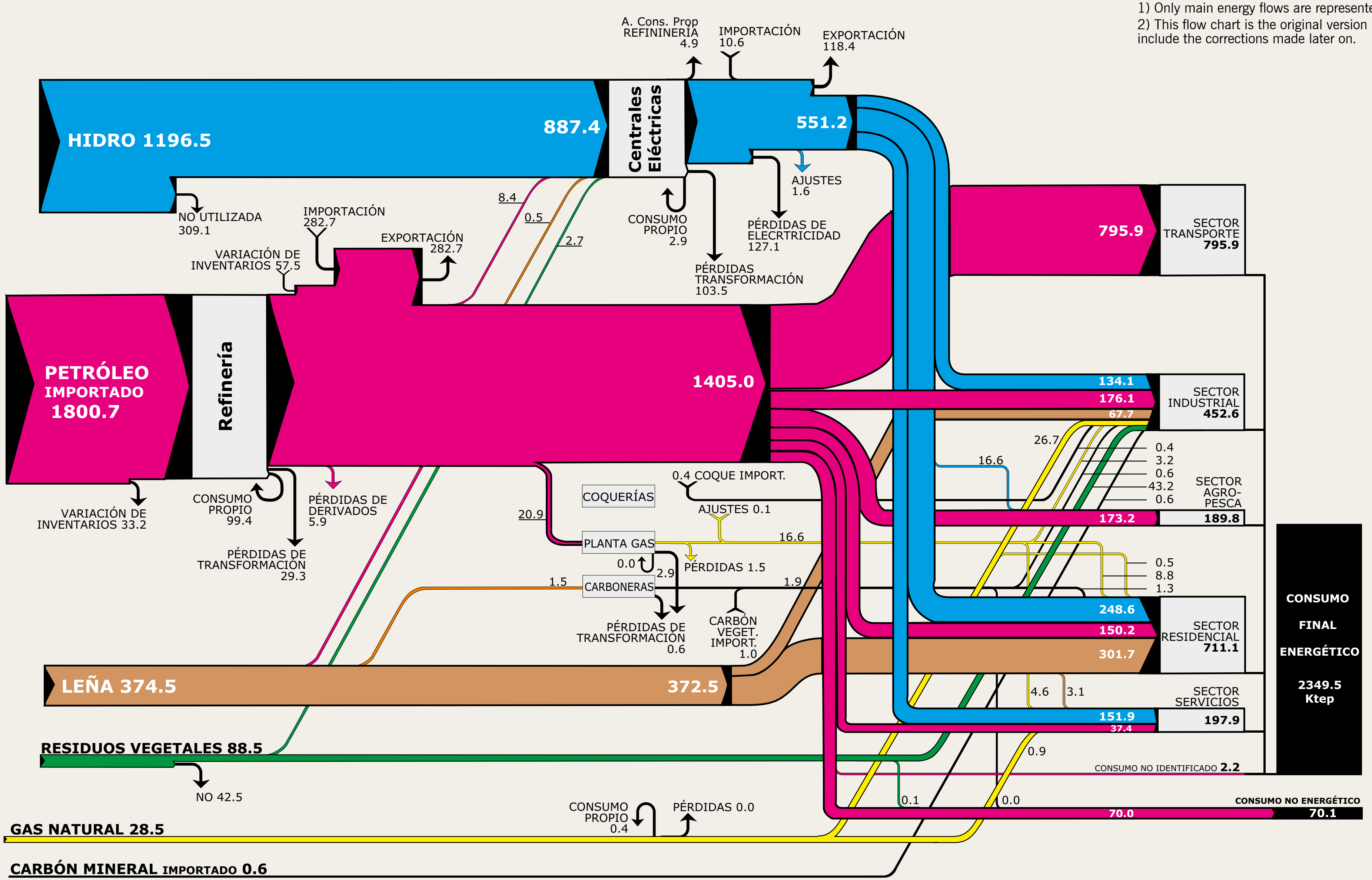
Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

2001 (ktoe)	▼ Energía primaria							▼ Energía secundaria																		
	PETRÓLEO	CARBÓN MINERAL	GAS NATURAL	HIDROENERGÍA	LEÑA	RESIDUOS BIOMASA	TOTAL	GLP	GASOLINA AUTOMOTRIZ	NAFTA LIVIANA	GASOLINA AVIACIÓN	QUEROSENO	TURBOCOMBUSTIBLE	DIÉSEL OIL	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	GAS MANUFACTURADO	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	TOTAL	PÉRDIDAS TRANSFORMACIÓN	TOTAL
PRODUCCIÓN				1,196.5	393.6	88.5	**1,678.6**	95.5	303.3	10.1	0.5	23.9	55.5	4.1	578.5	490.3	24.0	118.0	34.5	11.2		0.3	795.5	**2,545.2**		
IMPORTACIÓN	1,800.7	0.6	28.5				**1,829.8**	37.8			1.9				225.4	0.1	0.4	17.1			0.4	1.0	10.6	**294.7**		
EXPORTACIÓN									-34.9	-3.1		-9.3	-53.6	-11.5	-90.3	-277.2		-58.9					-118.4	**-657.2**		
PÉRDIDAS			0.0					-2.8	-1.1	0.0	-0.1	-0.2		-0.4		-1.4		-0.1		-1.3			-127.1	**-134.5**		
VARIACIÓN INVENTARIO	-33.2						**-33.2**	-1.5	9.7	4.0	0.5	2.7	3.1	10.8	13.7	21.5		-6.9						**57.6**		
NO UTILIZADA				-309.1		-42.5	**-351.6**																			
AJUSTES											0.1	-0.1						0.1		0.1			-1.6	**-1.4**		
OFERTA	1,767.5	0.6	28.5	887.4	393.6	46.0	**3,123.6**	129.0	277.0	11.0	2.9	17.0	5.0	3.0	727.3	233.3	24.4	69.3	34.5	10.0	0.4	1.3	559.0	**2,104.4**		
REFINERÍAS	-1,767.5						**-1,767.5**	95.5	303.3	10.1	0.5	23.9	55.5	4.1	578.5	490.3	24.0	118.0	34.5					**1,738.2**	-29.3	
CENTRALES ELÉCTRICAS SERV, PÚB,				-887.4			**-887.4**							0.0	-3.8	-3.1							792.0	**785.1**	-102.3	
CENTRALES ELÉCTRICAS AUTOPROD,					-0.5	-2.7	**-3.2**								-0.3	-1.2							3.5	**2.0**	-1.2	
CARBONERAS					-0.5		**-0.5**															0.3		**0.3**	-0.2	
PLANTAS DE GAS								-3.5		-11.0										11.2				**-3.3**	-3.3	
CENTROS DE TRANSFORMACIÓN	-1,767.5			-887.4	-1.0	-2.7	**-2,658.6**	92.0	303.3	-0.9	0.5	23.9	55.5	4.1	574.4	486.0	24.0	118.0	34.5	11.2		0.3	795.5	**2,522.3**	-136.3	
OFERTA BRUTA	1,767.5	0.6	28.5	1,196.5	393.6	88.5	**3,475.2**	131.8	278.1	11.0	3.0	17.2	5.0	3.4	727.3	234.7	24.4	69.4	34.5	11.3	0.4	1.3	686.1	**2,238.9**		**3,168.9**
CONSUMO NETO TOTAL		0.6	28.5		392.6	43.3	**465.0**	125.5	277.0	0.0	2.9	17.0	5.0	3.0	723.2	229.0	24.4	69.3	34.5	10.0	0.4	1.3	559.0	**2,081.5**		**2,546.5**
CONSUMO PROPIO			0.4				**0.4**	0.8	0.0	0.0		0.0			1.2	38.8	24.0	0.1	34.5	0.0			7.8	**107.2**		**107.6**
CONSUMO FINAL TOTAL		0.6	28.1		392.6	43.3	**464.6**	124.7	277.0		2.9	17.0	5.0	3.0	722.0	190.2	0.4	69.2		10.0	0.4	1.3	551.2	**1,974.3**		**2,438.9**
CONSUMO FINAL NO ENERGÉTICO						0.1	**0.1**	0.0	0.2			0.4			0.2			69.2						**70.0**		**70.1**
CONSUMO FINAL ENERGÉTICO		0.6	28.1		392.6	43.2	**464.5**	124.7	276.8		2.9	16.6	5.0	3.0	721.8	190.2	0.4			10.0	0.4	1.3	551.2	**1,904.3**		**2,368.8**
SECTORES ▸																										
RESIDENCIAL			0.5		301.7		**302.2**	108.8				15.1		2.0	1.2	26.5				5.8		1.3	248.6	**409.3**		**711.5**
COMERCIAL/SERVICIOS/SECTOR PÚB,			0.2		3.1		**3.3**	3.0				0.2		0.5	27.3	9.0				3.6			151.9	**195.5**		**198.8**
TRANSPORTE									265.3		2.9		5.0	0.0	522.3	0.4								**795.9**		**795.9**
INDUSTRIAL		0.6	27.4		87.8	43.2	**159.0**	12.9	0.2			1.3		0.5	6.9	154.3	0.4			0.6	0.4		134.1	**311.6**		**470.6**
ACTIVIDADES PRIMARIAS									9.1						164.1								16.6	**189.8**		**189.8**
NO IDENTIFICADO									2.2															**2.2**		**2.2**

FLOW CHART
2001
(ktoe)

NOTES:
1) Only main energy flows are represented.
2) This flow chart is the original version and does not include the corrections made later on.



Ministerio de Industria, Energía y Minería

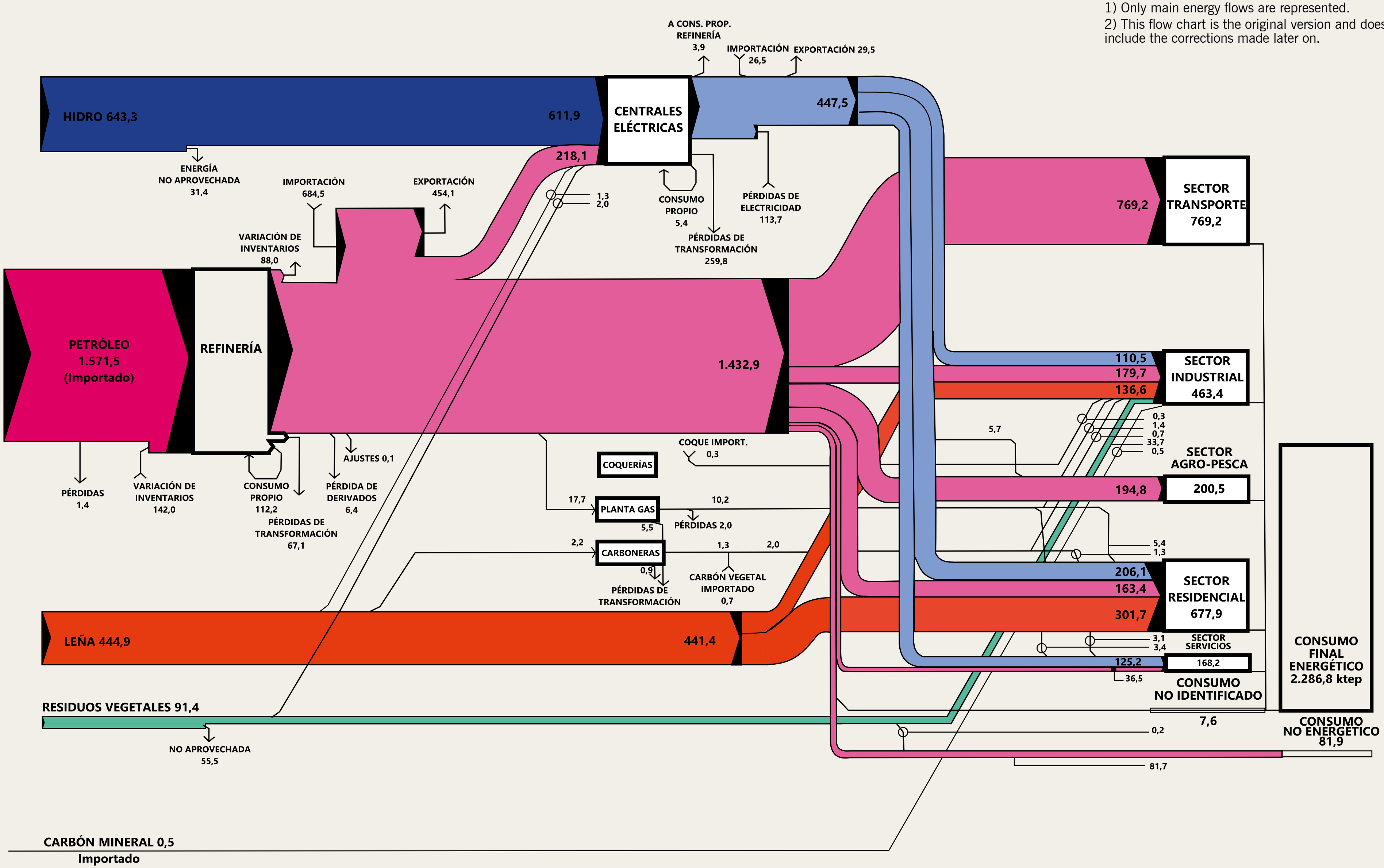
BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

1996 (ktoe)

1996 (ktoe)	Energía primaria						Energía secundaria																		
	PETRÓLEO	CARBÓN MINERAL	HIDROENERGÍA	LEÑA	RESIDUOS BIOMASA	**TOTAL**	GLP	GASOLINA AUTOMOTRIZ	NAFTA LIVIANA	GASOLINA AVIACIÓN	QUEROSENO	TURBOCOMBUSTIBLE	DIÉSEL OIL	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	GAS MANUFACTURADO	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	**TOTAL**	PÉRDIDAS TRANSFORMACIÓN	**TOTAL**
PRODUCCIÓN			643.3	444.9	91.4	**1,179.6**	41.4	259.6	17.9	0.2	37.0	42.9	100.9	519.7	529.4	0.0	64.2	30.2	12.2		1.3	573.5	**2,230.4**		
IMPORTACIÓN	1,571.5	0.5				**1,572.0**	66.8	125.0		3.8			37.1	327.4	106.8	0.4	17.2			0.3	0.7	26.5	**712.0**		
EXPORTACIÓN								-29.5		-0.3		-35.0	-105.8	-80.3	-203.2		-0.5					-29.5	**-484.1**		
PÉRDIDAS	-1.4					**-1.4**	0.0	-3.2	-0.3	-0.2	-0.9	-0.5	-0.3		-0.8		-0.2		-2.0			-113.7	**-122.1**		
VARIACIÓN INVENTARIO	142.0					**142.0**	-1.3	-7.4	0.0	-0.5	-3.3	-2.5	-25.6	-49.9	2.8		-0.3						**-88.0**		
NO UTILIZADA			-31.4		-52.1	**-83.5**												0.0							
AJUSTES											-0.1												**-0.1**		
OFERTA	1,712.1	0.5	611.9	444.9	39.3	**2,808.7**	106.9	344.5	17.6	3.0	32.7	4.9	6.3	716.9	435.0	0.4	80.4	30.2	10.2	0.3	2.0	456.8	**2,248.1**		
REFINERÍAS	-1,712.1					**-1,712.1**	41.4	259.6	17.9	0.2	37.0	42.9	100.9	519.7	529.4	0.0	64.2	30.2					**1,643.4**	-68.7	
CENTRALES ELÉCTRICAS SERV, PÚB,			-611.9			**-611.9**								-52.2	-158.1							567.5	**357.2**	-254.7	
CENTRALES ELÉCTRICAS AUTOPROD,				-1.3	-2.0	**-3.3**							0.0	-0.3	-7.5							6.0	**-1.8**	-5.1	
CARBONERAS				-2.2		**-2.2**															1.3		**1.3**	-0.9	
PLANTAS DE GAS							-0.1		-17.6										12.2				**-5.5**	-5.5	
CENTROS DE TRANSFORMACIÓN	-1,712.1		-611.9	-3.5	-2.0	**-2,329.5**	41.3	259.6	0.3	0.2	37.0	42.9	100.9	467.2	363.8	0.0	64.2	30.2	12.2		1.3	573.5	**1,994.6**	-334.9	
OFERTA BRUTA	1,713.5	0.5	643.3	444.9	91.4	**2,893.6**	106.9	347.7	17.9	3.2	33.6	5.4	6.6	716.9	435.8	0.4	80.6	30.2	12.2	0.3	2.0	570.5	**2,370.2**		**3,033.4**
CONSUMO NETO TOTAL		0.5		441.4	37.3	**479.2**	106.8	344.5		3.0	32.7	4.9	6.3	664.4	269.4	0.4	80.4	30.2	10.2	0.3	2.0	456.8	**2,012.3**		**2,491.5**
CONSUMO PROPIO							6.2	0.0			0.0		0.0	1.7	44.2		0.0	30.2	0.0			9.3	**91.6**		**91.6**
CONSUMO FINAL TOTAL		0.5		441.4	37.3	**479.2**	100.6	344.5		3.0	32.7	4.9	6.3	662.7	225.2	0.4	80.4		10.2	0.3	2.0	447.5	**1,920.7**		**2,399.9**
CONSUMO FINAL NO ENERGÉTICO		0.0			0.2	**0.2**		0.2			0.4			0.2			80.4			0.0	0.0		**81.2**		**81.4**
CONSUMO FINAL ENERGÉTICO		0.5		441.4	37.1	**479.0**	100.6	344.3		3.0	32.3	4.9	6.3	662.5	225.2	0.4			10.2	0.3	2.0	447.5	**1,839.5**		**2,318.5**
SECTORES ▸ RESIDENCIAL				301.7		**301.7**	98.5				30.8		3.1	6.6	24.4				5.4		1.3	206.1	**376.2**		**677.9**
COMERCIAL/SERVICIOS/SECTOR PÚB,				3.1		**3.1**	0.3				0.3		0.7	29.1	6.1				3.4			125.2	**165.1**		**168.2**
TRANSPORTE								330.1		3.0		4.9	0.0	431.1	0.0								**769.1**		**769.1**
INDUSTRIAL		0.5		136.6	37.1	**174.2**	1.8	0.2			1.2		2.5	7.3	194.7	0.4			1.4	0.3	0.7	110.5	**321.0**		**495.2**
ACTIVIDADES PRIMARIAS								11.3						183.5								5.7	**200.5**		**200.5**
NO IDENTIFICADO								2.7						4.9									**7.6**		**7.6**

FLOW CHART
1996
(ktoe)

NOTES:
1) Only main energy flows are represented.
2) This flow chart is the original version and does not include the corrections made later on.



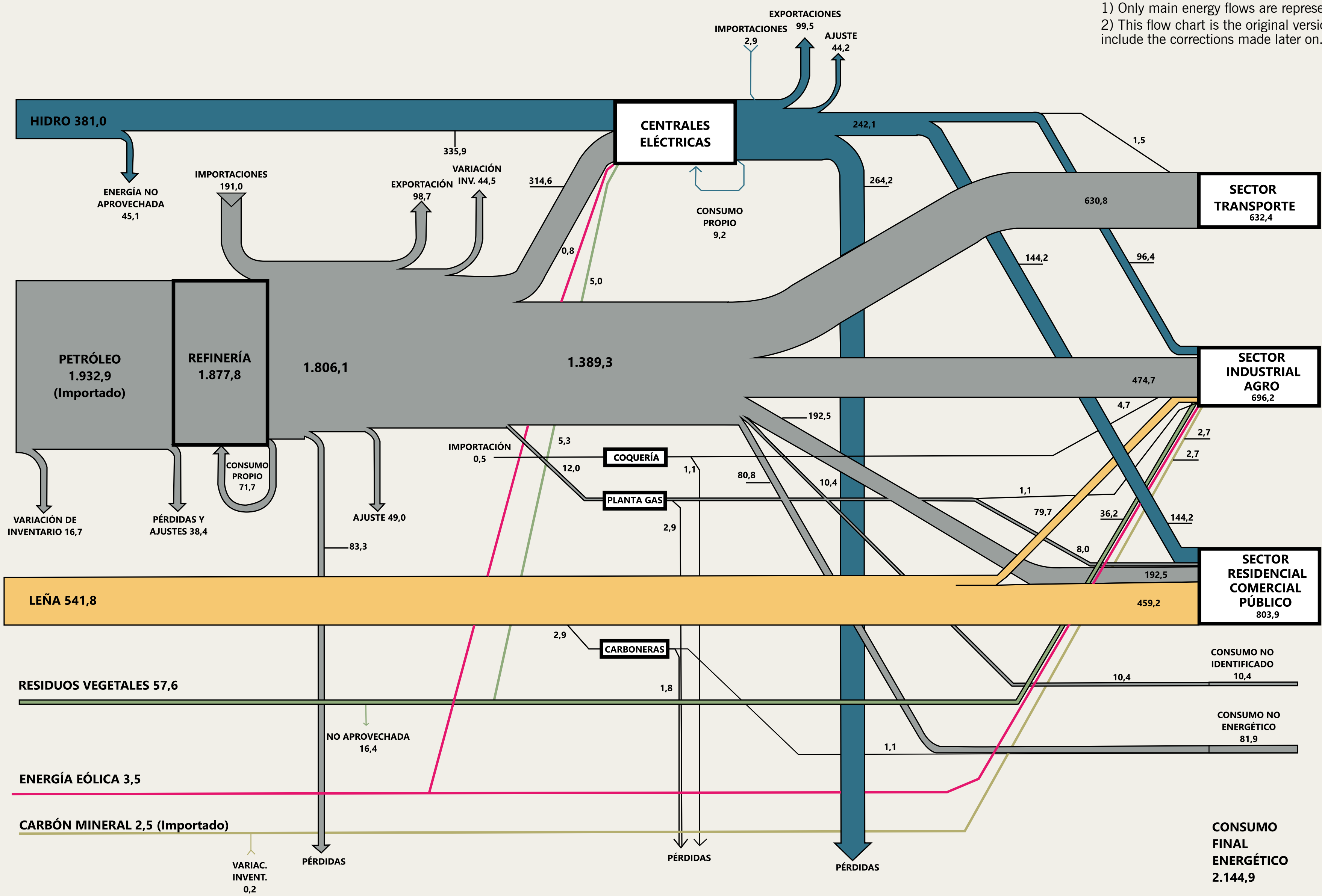
Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

1980 (ktoe)	Energía primaria						Energía secundaria																
	PETRÓLEO	CARBÓN MINERAL	HIDROENERGÍA	LEÑA	RESIDUOS BIOMASA	**TOTAL**	GLP	GASOLINA AUTOMOTRIZ	NAFTA LIVIANA	GASOLINA AVIACIÓN	QUEROSENO	DIÉSEL OIL	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	GAS MANUFACTURADO	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	**TOTAL**	PÉRDIDAS TRANSFORMACIÓN	**TOTAL**
PRODUCCIÓN			381.0	426.5	54.7	**862.2**	44.4	240.8	13.1	0.9	154.5	88.8	397.1	760.9	10.8	62.2	26.0	8.8	4.2	1.1	292.6	**2,106.2**		
IMPORTACIÓN	1,899.9	2.5				**1,902.4**	4.7			2.3	4.1		78.7	65.3	5.3	26.0			0.5		2.9	**189.8**		
EXPORTACIÓN								-1.6	-2.0		-17.7	-38.5	-5.3	-32.8							-0.0	**-97.9**		
PÉRDIDAS	-6.2					**-6.2**		-1.0	0.0		-0.6		-0.7	-0.1		-0.3		-0.6			-47.3	**-50.6**		
VARIACIÓN INVENTARIO	-16.4	0.2				**-16.2**	0.5	17.0	1.8	1.7	3.2	-2.8	-17.5	-54.2		-9.3						**-59.6**		
NO UTILIZADA			-45.1		-14.1	**-59.2**	-0.2								-10.8		-3.9					**-14.9**		
AJUSTES	-31.6					**-31.6**	0.2	-6.6	-0.1	1.5	-6.2	-3.1	7.2	-42.3		2.2						**-47.2**		
OFERTA	1,845.7	2.7	335.9	426.5	40.6	**2,651.4**	49.6	248.6	12.8	6.4	137.3	44.4	459.5	696.8	5.3	80.8	22.1	8.2	4.7	1.1	248.2	**2,025.8**		
REFINERÍAS	-1,845.7					**-1,845.7**	44.4	240.8	13.1	0.9	154.5	88.8	397.1	760.9	10.8	62.2	26.0					**1,799.5**	-46.2	
CENTRALES ELÉCTRICAS SERV, PÚB,			-335.9			**-335.9**						-23.3	-14.0	-217.8							283.2	**28.1**	-307.8	
CENTRALES ELÉCTRICAS AUTOPROD,					-5.0	**-5.0**							-3.9	-34.5							9.4	**-29.0**	-34.0	
CARBONERAS				-2.1		**-2.1**														1.1		**1.1**	-1.0	
PLANTAS DE GAS									-12.8									8.8				**-4.0**	-4.0	
COQUERÍAS															-5.3				4.2			**-1.1**	-1.1	
CENTROS DE TRANSFORMACIÓN	-1,845.7		-335.9	-2.1	-5.0	**-2,188.7**	44.4	240.8	0.4	0.9	154.5	65.5	379.2	508.6	5.5	62.2	26.0	8.8	4.2	1.1	292.6	**1,794.7**	-394.0	
OFERTA BRUTA	1,851.9	2.7	381.0	426.5	54.7	**2,716.8**	49.8	249.6	12.8	6.4	137.9	44.4	460.2	696.9	16.1	81.1	26.0	8.2	4.7	1.1	295.5	**2,090.7**		**2,701.9**
CONSUMO NETO TOTAL		2.7		424.4	35.6	**462.7**	49.6	248.6		6.4	137.3	21.1	441.5	444.5		80.8	22.1	8.2	4.7	1.1	248.2	**1,714.1**		**2,176.8**
CONSUMO PROPIO														44.4			22.1	0.0			9.2	**75.7**		**75.7**
CONSUMO FINAL TOTAL		2.7		424.4	35.6	**462.7**	49.6	248.6		6.4	137.3	21.1	441.5	400.1		80.8		8.2	4.7	1.1	239.0	**1,638.4**		**2,101.1**
CONSUMO FINAL NO ENERGÉTICO																80.8				1.1		**81.9**		**81.9**
CONSUMO FINAL ENERGÉTICO		2.7		424.4	35.6	**462.7**	49.6	248.6		6.4	137.3	21.1	441.5	400.1				8.2	4.7		239.0	**1,556.5**		**2,019.2**
SECTORES ▸ RESIDENCIAL				318.3		**318.3**	48.2				115.6	2.5	10.6	1.9				4.5			100.1	**283.4**		**601.7**
COMERCIAL/SERVICIOS/SECTOR PÚB,				26.1		**26.1**						0.8	14.2	11.3				2.7			44.1	**73.1**		**99.2**
TRANSPORTE								235.4		6.4	15.6	14.4	243.8	34.0							1.5	**551.1**		**551.1**
INDUSTRIAL		2.7		80.0	35.6	**118.3**	1.4	4.7			3.2	3.4	11.4	352.9				1.0	4.7		93.3	**476.0**		**594.3**
ACTIVIDADES PRIMARIAS								0.3					160.1									**160.4**		**160.4**
NO IDENTIFICADO								8.2			2.9		1.4									**12.5**		**12.5**

FLOW CHART
1980
(ktoe)

NOTES:
1) Only main energy flows are represented.
2) This flow chart is the original version and does not include the corrections made later on.



Ministerio de Industria, Energía y Minería

BEN BALANCE ENERGÉTICO NACIONAL URUGUAY

1965 (ktoe)	Energía primaria						Energía secundaria														
	PETRÓLEO	CARBÓN MINERAL	HIDROENERGÍA	LEÑA	RESIDUOS BIOMASA	TOTAL	GLP	GASOLINA AUTOMOTRIZ	QUEROSENO	GASOIL	FUELOIL	COQUE DE PETRÓLEO	NO ENERGÉTICO	GAS FUEL	GAS MANUFACTURADO	COQUE DE CARBÓN	CARBÓN VEGETAL	ELECTRICIDAD	TOTAL	PÉRDIDAS TRANSFORMACIÓN	TOTAL
PRODUCCIÓN			60.2	357.2	24.0	**441.4**	21.1	290.7	177.9	301.2	683.2	7.5	18.6	7.3	11.2	10.2	0.7	147.5	**1,677.1**		
IMPORTACIÓN	1,712.9	32.6				**1,745.5**		16.5	6.1	8.8	111.1		13.6			2.2		0.1	**158.4**		
EXPORTACIÓN								-1.6	-4.1	-24.3	-71.5							-0.1	**-101.6**		
PÉRDIDAS	-41.7					**-41.7**		-0.8	-0.5	-0.8	-1.9		0.0		-1.1			-21.9	**-27.0**		
VARIACIÓN INVENTARIO	-53.5	-1.0				**-54.5**	-0.4	-0.8	-0.9	-5.8	26.9		0.8			1.3			**21.1**		
NO UTILIZADA					-8.5	**-8.5**	-0.1					-7.5		-1.1					**-8.7**		
AJUSTES	-9.9					**-9.9**	0.1	-0.1	7.6	0.4	-5.8		0.1			0.2			**2.5**		
OFERTA	1,607.8	31.6	60.2	357.2	15.5	**2,072.3**	20.7	303.9	186.1	279.5	742.0	0.0	33.1	6.2	10.1	13.9	0.7	125.6	**1,721.8**		
REFINERÍAS						**-1,607.8**	21.1	290.7	177.9	301.2	683.2	7.5	18.6	7.3					**1,507.5**	-100.3	
CENTRALES ELÉCTRICAS SERV, PÚB,			-60.2			**-60.2**				-32.7	-280.1							141.8	**-171.0**	-231.2	
CENTRALES ELÉCTRICAS AUTOPROD,					-0.4	**-0.4**				-4.6	-21.0							5.7	**-19.9**	-20.3	
CARBONERAS				-1.4		**-1.4**											0.7		**0.7**	-0.7	
PLANTAS DE GAS	-26.5					**-26.5**									11.2	10.2			**21.4**	-5.1	
CENTROS DE TRANSFORMACIÓN	-26.5		-60.2	-1.4	-0.4	**-1,696.3**	21.1	290.7	177.9	263.9	392.1	7.5	18.6	7.3	11.2	10.2	0.7	147.5	**1,348.7**	-347.6	
OFERTA BRUTA	31.6	2.7	60.2	357.2	24.0	**2,122.4**	20.8	304.7	186.6	280.3	743.9	7.5	33.1	7.3	11.2	13.9	0.7	147.5	**1,757.5**		**2,202.9**
CONSUMO NETO TOTAL	5.1	2.7		355.8	15.1	**376.0**	20.7	303.9	186.1	242.3	441.0		33.1	6.2	10.1	13.9	0.7	125.6	**1,383.6**		**1,759.6**
CONSUMO PROPIO											29.9			6.2	0.0	1.4		7.1	**44.6**		**44.6**
CONSUMO FINAL TOTAL	5.1	2.7		355.8	15.1	**376.0**	20.7	303.9	186.1	242.3	411.1		33.1		10.1	12.5	0.7	118.5	**1,339.0**		**1,715.0**
CONSUMO FINAL NO ENERGÉTICO													33.1				0.7		**33.8**		**33.8**
CONSUMO FINAL ENERGÉTICO	5.1	2.7		355.8	15.1	**376.0**	20.7	303.9	186.1	242.3	411.1				10.1	12.5		118.5	**1,305.2**		**1,681.2**
SECTORES: RESIDENCIAL				296.5		**296.5**	20.1		150.2	13.5	8.9				9.5			53.1	**255.3**		**551.8**
SECTORES: COMERCIAL/SERVICIOS/SECTOR PÚB,				24.2		**24.2**												13.4	**13.4**		**37.6**
SECTORES: TRANSPORTE								260.5	3.4	175.3	77.5							2.1	**518.8**		**518.8**
SECTORES: INDUSTRIAL		5.1		35.1	15.1	**55.3**	0.6	5.6	7.0	7.3	324.7				0.6	12.5		49.9	**408.2**		**463.5**
SECTORES: ACTIVIDADES PRIMARIAS								34.0	22.0	46.2									**102.2**		**102.2**
SECTORES: NO IDENTIFICADO								3.8	3.5										**7.3**		**7.3**

Start
Table of Contents
Go back

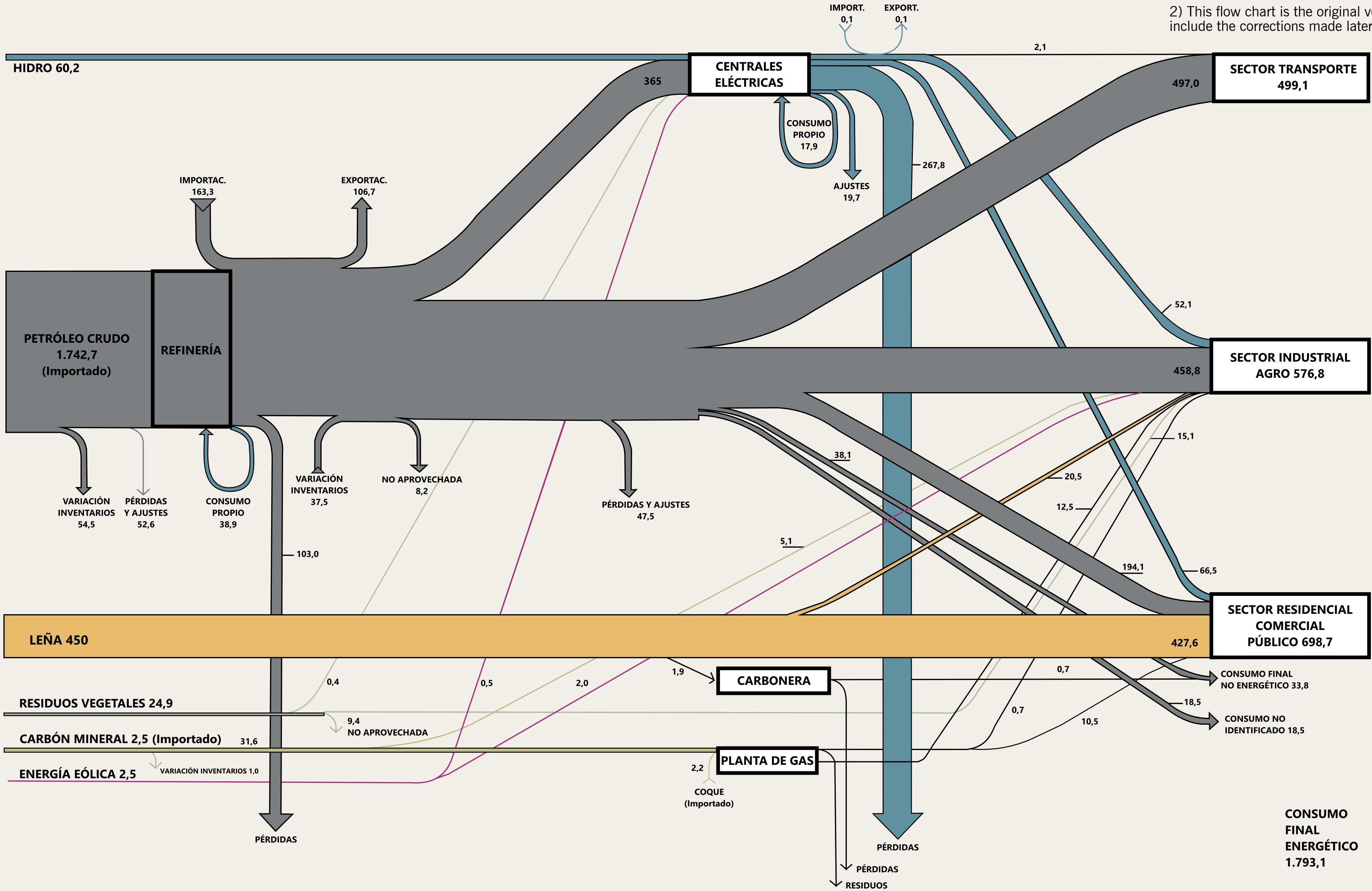
1965

(ktoe)

NOTES:

1) Only main energy flows are represented.

2) This flow chart is the original version and does not include the corrections made later on.



Energy Balance 2020

República Oriental del Uruguay
Ministry of Industry, Energy and Mining
National Directorate of Energy