

ARGENTINA

ENERGY SITUATIONAL
AND STAKEHOLDER ANALYSIS

—
100% RENEWABLES
CITIES & REGIONS ROADMAP



CONTRIBUTORS

ICLEI SOUTH AMERICA

Rodrigo Perpétuo
Executive Secretary

Camila Chabar
Low-Carbon Regional Coordinator

Lucas Turmena
Low Carbon Regional Officer

Flavia Speyer
Low Carbon Regional Analyst

Reynaldo Neto
Low Carbon Regional Analyst

ICLEI ARGENTINA

Maria Julia Reyna
Office Director

PROJECT CONSULTANTS

Marco Massacesi
Red Argentina de Municipios frente al Cambio Climático.

Rocío Pascual
Red Argentina de Municipios frente al Cambio Climático

ABOUT ICLEI

ICLEI – Local Governments for Sustainability is a global network of more than 1,750 local and regional governments committed to sustainable urban development. Active in 100+ countries, we influence sustainability policy and drive local action for low emission, nature-based, equitable, resilient and circular development. Our Members and team of experts work together through peer exchange, partnerships and capacity building to create systemic change for urban sustainability.

ABOUT THE 100% RENEWABLES

The project is implemented by ICLEI – Local Governments for Sustainability and funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through the International Climate Initiative (IKI). The 100% RE Project offers support to national and regional level governments to promote a move towards 100% RE strategies with increased awareness and stakeholder engagement in the countries of Kenya, Indonesia and Argentina. The 100% RE project works with cities and regions in the focus countries to build a path for global south cities to finance and implement renewable energy, through the assessment of local RE potential and project concepts, as well as the development of financeable projects.

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ICLEI SAMS - South America Secretariat
Rua Marquês de Itu, 70 • 14 andar. São Paulo, SP, Brasil. • americadosul.iclei.org
americadosul.iclei.org.

WITH CONTRIBUTIONS FROM

ICLEI WS - World Secretariat: Laura Noriega, Rohit Sen.

Ministry of Productive Development in Argentina, Renewable Energy Secretariat: Gabriela Rijter, Anabella Ruiz.

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LIST OF ABBREVIATIONS AND ACRONYMS

ABBREVIATIONS AND ACRONYMS	DESCRIPTION
% a.a	Per annum variation
ADEERA	Asociación de Distribuidores de Energía Eléctrica de la República Argentina
ADIGAS	Asociación de Distribuidores de Gas Natural de la República Argentina
AGEERA	Asociación de Generadores de Energía Eléctrica de la República Argentina
ARS	Argentinian currency: peso
ATEERA	Asociación de Transportistas de Energía Eléctrica de la República Argentina
bbl/d	barrels per day
boe/d	barrels per day
CAMMESA	Compañía Administradora del Mercado Mayorista Eléctrico Sociedad Anónima
ENARGAS	Ente Nacional Regulador del Gas
ENRE	Ente Nacional Regulador de Electricidad
GEI	Greenhouse gas
GLP	Liquified petroleum gas
MMARS	millones de pesos argentinos
MMm3/d	million cubic meter per day
MtCO _{2eq}	millones de toneladas de CO ₂ equivalente
NDC	Nationally determined contributions
PBI	Gross Domestic Product
SADI	Sistema Argentino de Interconexión
TEP	Tons Oil Equivalent
TGN	Transportadora Gas del Norte
TGS	Transportation company
USD	US Dolar

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INTRODUCTION

Argentina is located on the southeast part of the American continent and on part of Antarctica. The geographical coordinates of the country are 21° 46' S up to 55° 03' in latitude and 73° 34' W and 53° 38' W in longitude. Its total surface is 3.8 million km², from which 74% belongs to the continental portion and 26% to the Antarctic continent and the Austral Islands. Taking into consideration its size and extension, Argentina is the fourth biggest country among American countries and the seventh among all countries in the world. Its population on the year 2016 was 43.6 million inhabitants and, in 2020, this number is up to 45.3 million.

The country presents a variety of climates due to its extension. West and South of the country are characterized by arid and cold regions, whereas, Central and North present temperate and warm regions.

National geographic, climatic, demographic and institutional circumstances dictate the development of economic activities and, therefore, of territorial arrangement, according to the utilization of available resources and the sufficing of necessary changes for the performing of those activities.

Such circumstances hold some predominant factors [1]:

- There is an abundance of oil and gas reserves, which grant that the energy demand is met. Such demand is promoted by population growth, economy evolution and the great territorial extension. And all that impacts transportation fuel consumption.
- A number of regions with types of soil and climate conducive to agriculture and cattle raising, which, in turn, can be a driver activity to deforestation.

By the end of 2015, Argentina signs the Paris Agreement and commits to the goal of not exceeding 570 MtCO_{2eq} net greenhouse gas emissions (GHGs) by 2030. In the following year, Argentina improves its contribution by not emitting more than 483 MtCO_{2eq}. That was possible due to a revision to its NDC where new measures were incorporated aiming at climate change mitigation and adaptation. If conditional measures would have been included, the value of avoided emissions would have been 369 MtCO_{2eq} [2].

The goal will be met through the implementation of a series of measures (known as “sectoral plans”) throughout economy, with a focus on energy, agriculture, forestry, transportation, industry and waste sectors.

Activities which contribute to greenhouse gas emissions and its participation in the 2016 Inventory are: Energy (53%), Agriculture, Livestock, Forestry and other Land Use (37%), Industrial Processes and Product Use (6%) and Waste (4%). Through the NDC, sectoral plans work on those activities with the purpose of reaching a maximum of 483 MtCO_{2eq} goal [3].

By means of implementation of all measures (conditional and unconditional), Argentina would be able to reduce a total of 223 MtCO_{2eq} by

2030, respecting the projection made for the base year 2015. Given the contribution of Energy to total GHG emissions, its sectoral plan is the one which proposes a major reduction.

The National Energy and Climate Change Action Plan entails measures regarding energy supply and demand and has as goals the following: (i) provide clean and sustainable energy; (ii) promote responsible use of energy through energy efficiency; (iii) reduce GHG emissions; (iv) implement adaptation mechanisms able to reduce exposition to risk as well as social and energy systems vulnerability [3]. In particular, the country is committed to reaching a minimum contribution of 20% of the total electric energy consumed from renewable energy sources by 2025.

OVERVIEW OF THIS DOCUMENT

In general terms, this document approaches the energy situation in Argentina in a concise manner. Its focus is large-scale energy generation and, in particular, electricity, as it quantifies the current state of non-conventional renewable and non-renewable sources.

Chapter 1 focuses on energy supply and demand during the year 2019. It ends with a synthesis of GHG emissions per type of energy as well as with action plans as tools to comply with NDCs.

Chapter 2 describes the view of the horizon towards 2030 in terms of secondary energy generation as well as demand and final consumption. It also explains the success of energy efficiency measures and GHG emissions, products of the development of in progress policies and measures.

Chapter 3 approaches natural resources benefits as renewable energy sources, highlighting the variation of its potential across Argentinean territory.

Chapter 4 describes how governance presents itself in terms of energy. In addition, it presents the legal framework and legislative tools that regulate overall activities in renewable energy and in energy efficiency.

Chapter 5 depicts initiatives (and their current state) in effect since 2015 towards renewable energy and energy efficiency, in which this year represents a global turning point established by the Paris Agreement.

Chapters 6 and 7 close this document, pointing out local funding lines that would allow for the boosting of ICLEI 100% RE Project as well as mapping key actors for this proposal.

01

SHORT DESCRIPTION AND ENERGY SYSTEM STATE

The purpose of this chapter is to describe the current state of energy in Argentina. It includes some reference numbers and source participation, associated greenhouse gas emissions (GHG) and mitigation actions.

1.1 PRIMARY ENERGY

Attaining energy transition within a country means to reach decarbonization of its matrix, that is to say, energy production from sources that do not emit greenhouse gases, aiming at mitigating consequences triggered by the increase of the greenhouse effect.

In pursuit of attaining such transition, it is necessary to examine which Nature sources generate types of energy used by different sectors of a country. Energy resource in its natural state is called "primary energy".

However, this kind of energy can only be used after being treated, converted and transported to consumption centers in the shape of energy carriers or "secondary energy". Again, the aim of an energy transition is precisely to increase participation in primary energy coming from renewable energy sources. Thus, analyzing energy supply and demand is what provides the starting point for the projection of this migration.

As a priority commitment, the Paris Agreement main objective is to reverse the increase of greenhouse effect by 2050. The Nationally Determined Contributions (NDC) are the goals for Parties that signed the Agreement. In the search for mechanisms that comply with such guidelines, understanding the way energy is produced and used sets the basis for the development of action plans which aim at reducing CO₂ emissions.

Argentina records its levels of primary and secondary energy in the "National Energy Assessment" as well as import and export [4]. Within this account, final consumption sectors are included.

Figure 1 shows the Sankey diagram in regards to year 2018 and produced with the information pertaining to such Assessment [5]:

Figure 1: Energy Assessment for Argentina in 2018
Source: own creation based on National Energy Assessment 2019.

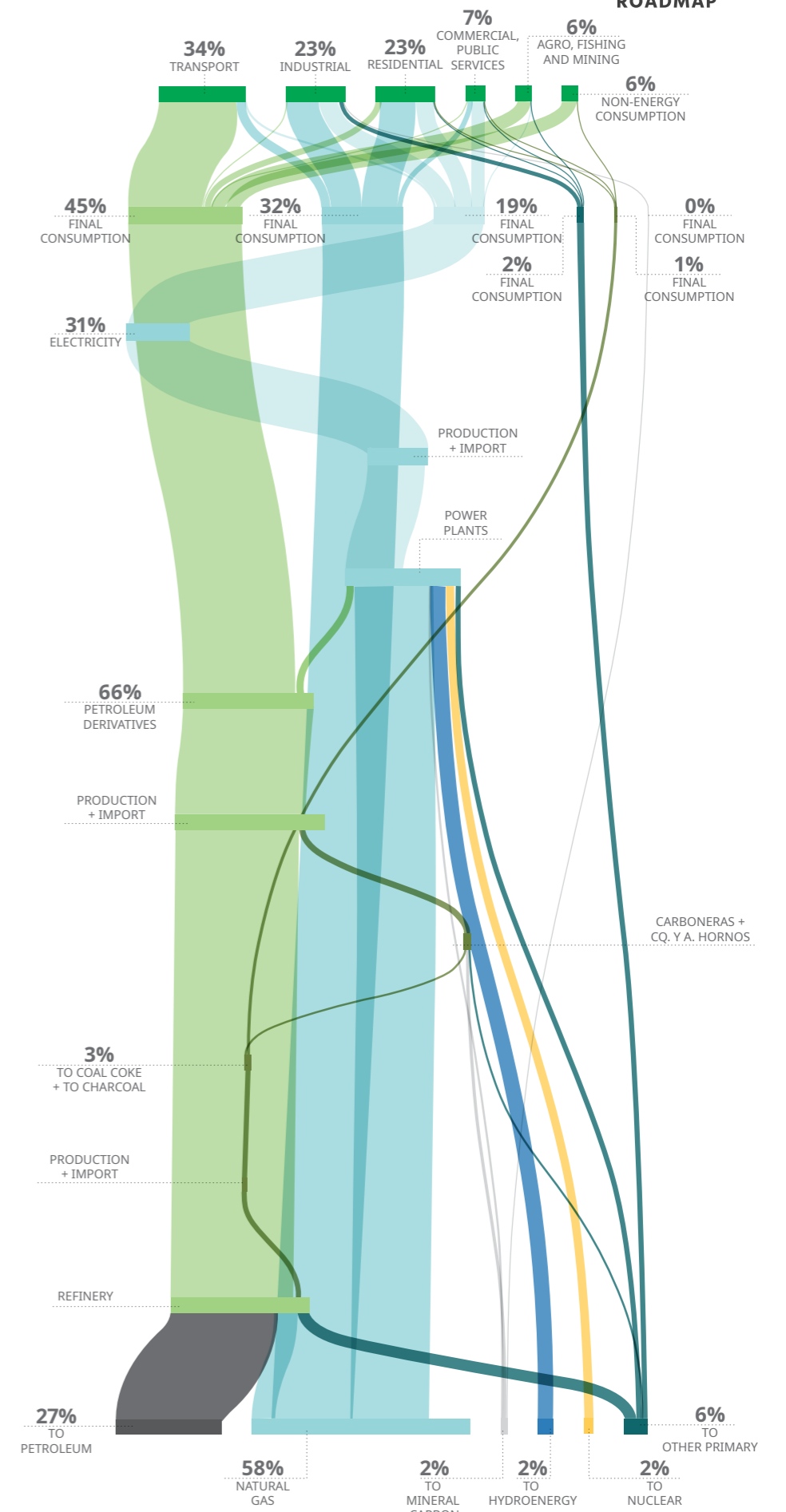
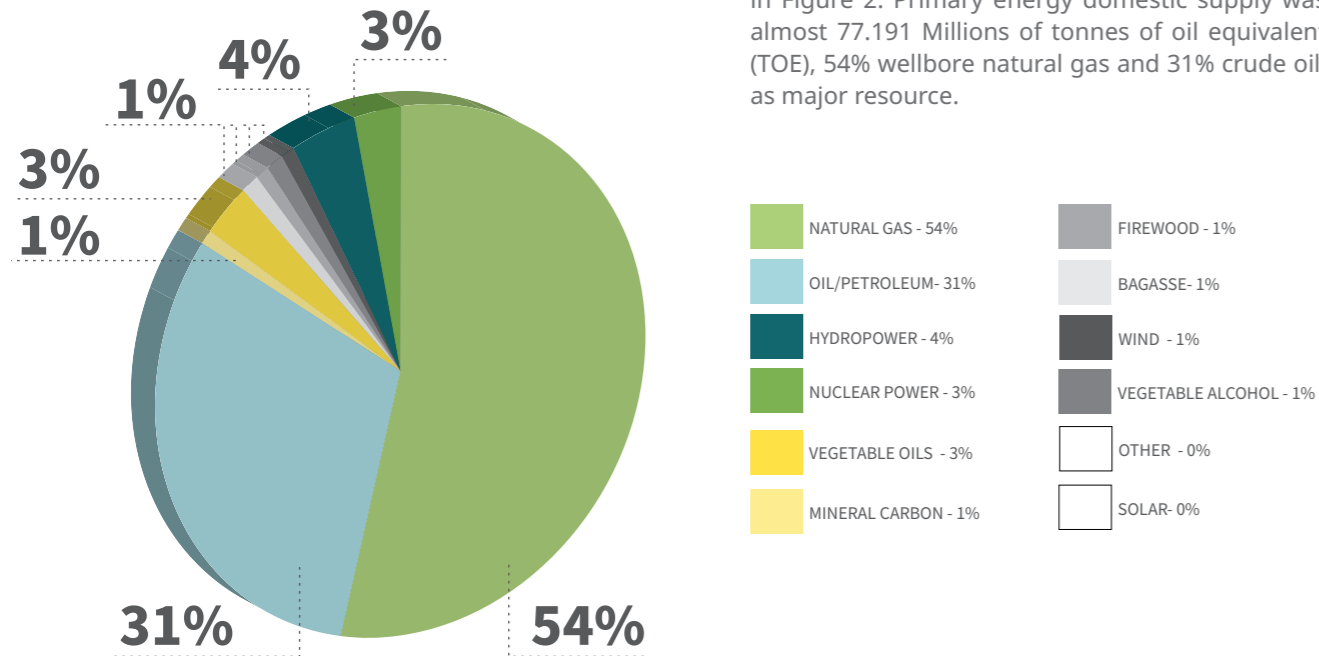


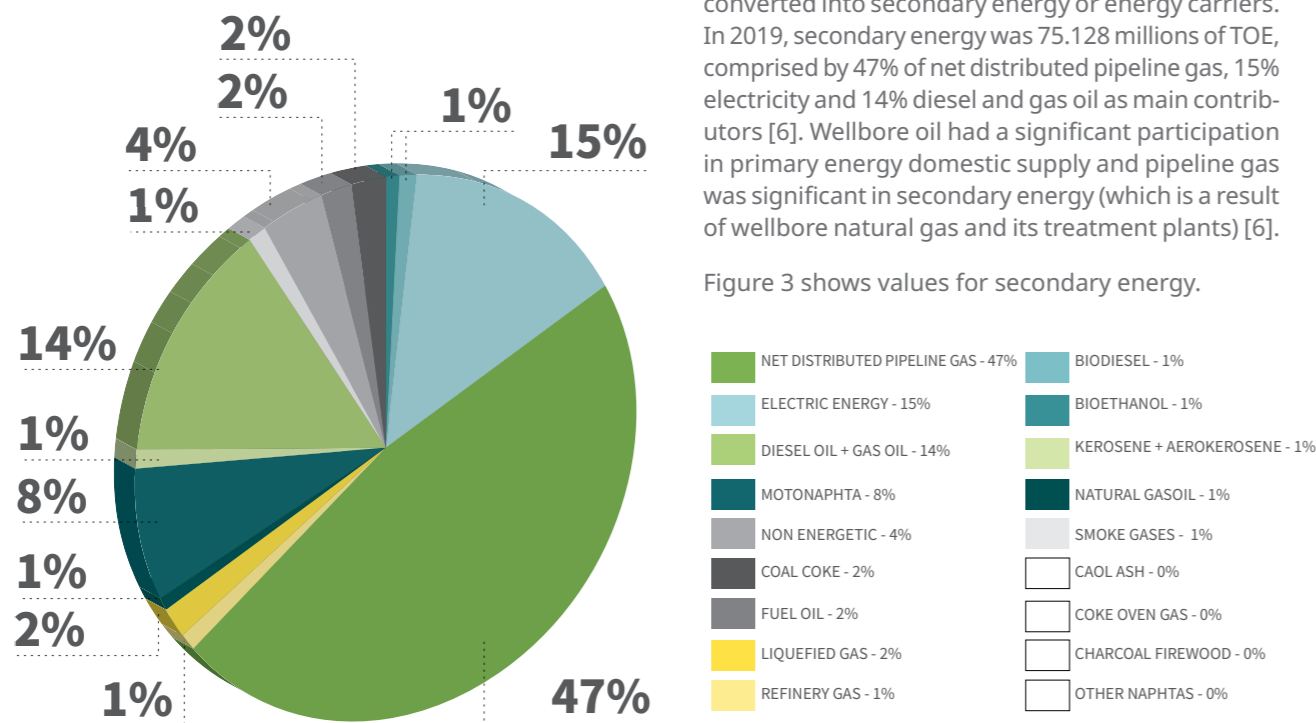
Figure 2: Primary Energy Domestic Supply in Argentina in 2019.



Source: Own creation based on National Energy Assessment 2019.

Starting in the 2019 edition, we notice the participation of each primary energy source as represented in Figure 2. Primary energy domestic supply was almost 77.191 Millions of tonnes of oil equivalent (TOE), 54% wellbore natural gas and 31% crude oil, as major resource.

Figure 3: Secondary Energy Domestic Supply in Argentina 2019.



Source: own creation based on the National Energy Assessment 2019.

1.2 __ SECONDARY ENERGY

In order to be transported from extraction points to consumption centers, primary energy has to be converted into secondary energy or energy carriers. In 2019, secondary energy was 75.128 millions of TOE, comprised by 47% of net distributed pipeline gas, 15% electricity and 14% diesel and gas oil as main contributors [6]. Wellbore oil had a significant participation in primary energy domestic supply and pipeline gas was significant in secondary energy (which is a result of wellbore natural gas and its treatment plants) [6].

Figure 3 shows values for secondary energy.

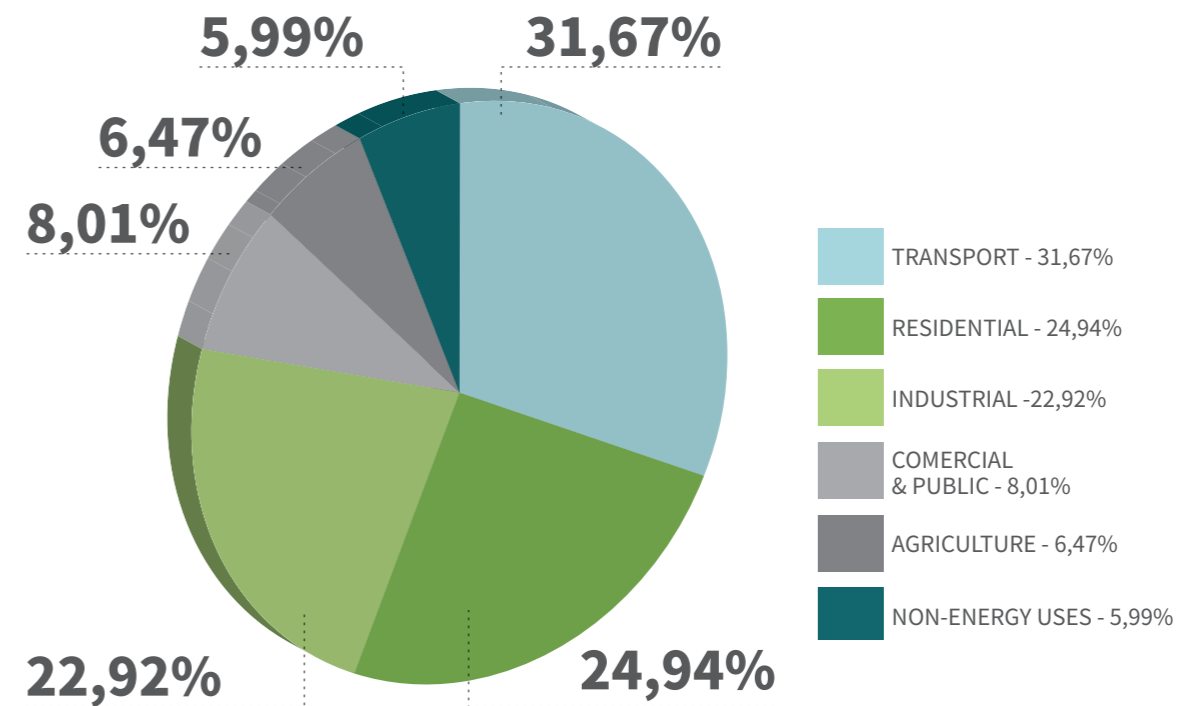
As per types of energy imports, 3.5% of primary energy was acquired from other countries, whereas the value for secondary energy reached 12.41%. In terms of secondary energy, 60% pertains to net distributed pipeline gas, followed by 20.91% in diesel oil and gas oil [6]. Importing natural gas was accomplished through pipelines in Bolivia or through shipped liquefied natural gas [7].

Energy consumption sectors are classified into six groups:

- Residential sector: final consumers are urban and rural households within the country.
- Business and Public sector: entails consumption from all business-related activities in the private sector as well as energy consumption from federal, provincial and municipal governments, public service organizations among others.
- Transportation sector: involves consumption from all transportation services within domestic territory for different means and modes of passenger and cargo transportation.
- Agribusiness sector: entails fuel consumption related to farming production, forestry and fishery.
- Industrial sector: involves energy consumption related to all industrial activities, be it extractive or manufacturing (small, medium and large industry) and for all kinds of use, except merchandise transportation (included in the transportation sector).
- Non-energy uses: use of resources for different purposes other than as fuel.

Figure 4 depicts secondary energy consumption sectors for 2019.

Figure 4: Secondary energy consumption final sectors in 2019

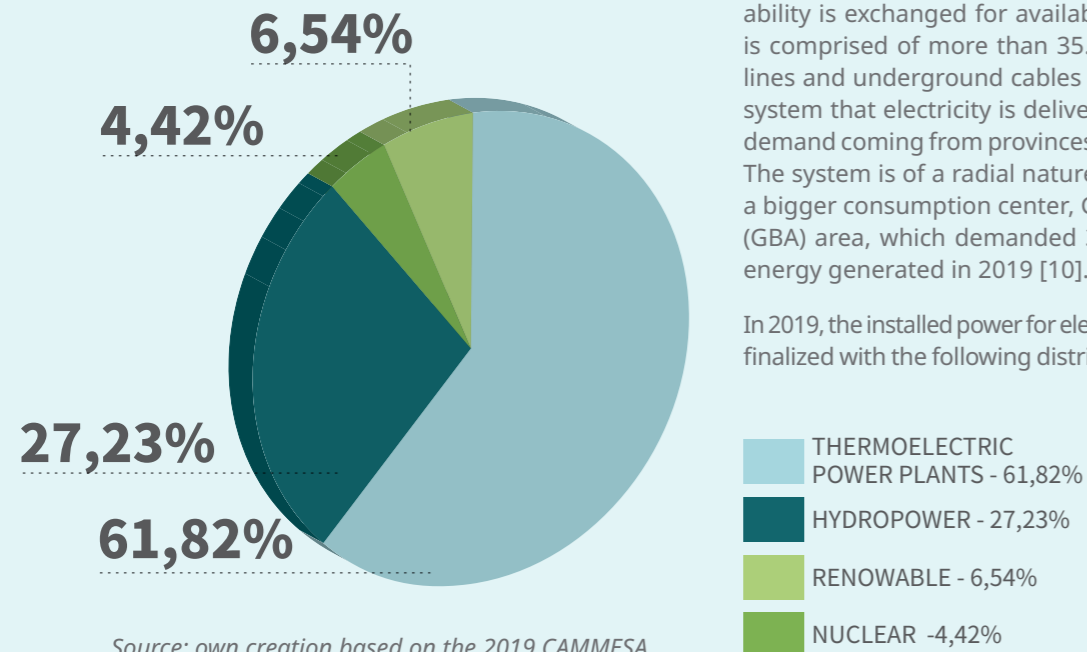


Source: own creation based on the National Energy Assessment 2019.

1.3 __ SECONDARY ENERGY CHARACTERIZATION

Apart from private contracts, electricity production is injected into an infrastructure called SADI Sistema Argentino de Interconexión (Argentina Interconnection System). All electric energy generated by non-renewable and renewable sources as well as imported energy are directed towards this system. SADI distributes

Figure 5: Installed power for electricity generation in 2019.

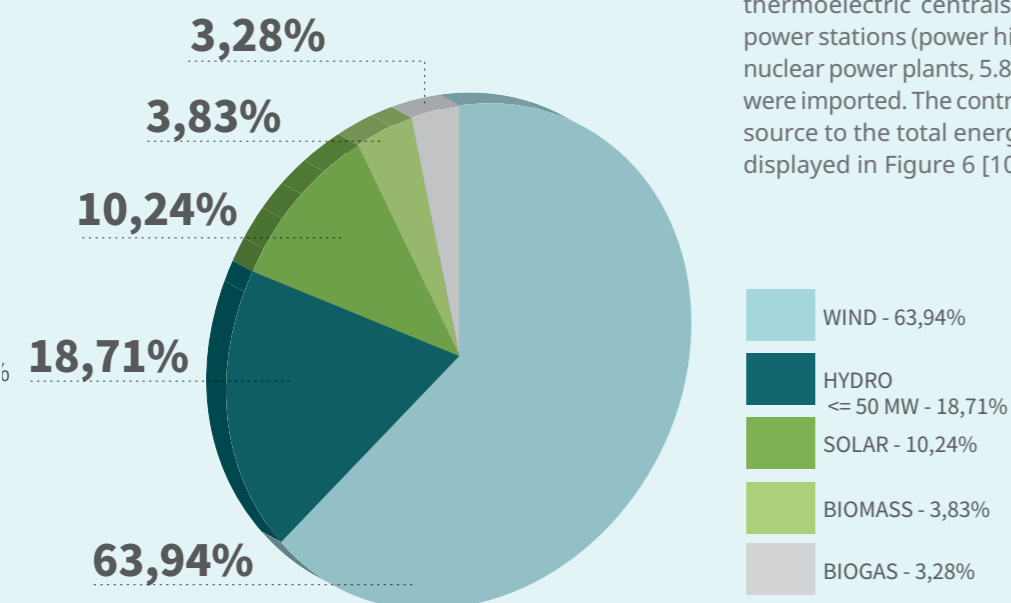


Source: own creation based on the 2019 CAMMESA Annual Report

energy through transportation networks (in tensions of 33, 66, 132, 220, 330 y 500 kV) to all regions in Argentina. In light of such quality, generation traceability is exchanged for availability. Presently, SADI is comprised of more than 35.000 km in overhead lines and underground cables [8] [9]. It is from this system that electricity is delivered according to the demand coming from provinces and conglomerates. The system is of a radial nature and converges into a bigger consumption center, Greater Buenos Aires (GBA) area, which demanded 37.7% of the electric energy generated in 2019 [10].

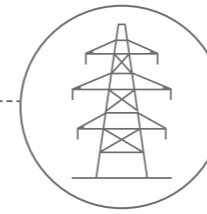
In 2019, the installed power for electricity generation was finalized with the following distribution (Figure 5) [10]:

Figure 6: Participation of each renewable electric energy source in 2019.



Source: own creation based on the 2019 CAMMESA Annual Report.

On the other hand, in regards to the electric energy generated during the year 2019, 59.8% came from thermolectric centrals, 26.4% from hydroelectric power stations (power higher than 50MV), 5.9% from nuclear power plants, 5.8% from renewables and 2.1% were imported. The contribution from each renewable source to the total energy generated during 2019 is displayed in Figure 6 [10]:



IN WHAT CONCERNS ACCESS TO ENERGY, ARGENTINA HOLDS A HIGH PENETRATION LEVEL WITH ITS ELECTRICITY GRID, WHICH REVOLVES AROUND 99%, AND THE REMAINING PERCENTAGE IS DIRECTED TO RURAL AREAS.

In regards to the fuels employed in thermolectric stations, natural gas prevails with 96%, followed by liquids (gasoil and fuel oil) with 3% and carbon with 1%.

As per the electric energy demand, in 2019, 128.9 TWh were demanded (3% less than in 2018). From this total, 43% was Residential, 29% Business and the 28% left to the Greater demand (comprised of the Grandes Usuarios del Mercado Eléctrico Mayorista and de Distribución). These denominations are given by the sector that relates SADI [10].

The agency which hosts the actors who generate 96% of electric energy is called Asociación de Generadores de Energía Eléctrica de la República Argentina (AGEERA) [11]. The other 4% is self-generated and co-generated.

In terms of natural gas, during the year of 2019, 24.053 millions of m3 in natural gas were delivered to distributors of such fuel (including the amount sent to thermolectric stations) [12].

In what concerns access to energy, Argentina holds a high penetration level with its electricity grid, which revolves around 99%, and the remaining percentage is directed to rural areas. However, the natural gas grid penetration level is around 64% of households (according to 2018 data). It is important to highlight the existing lack of access to energy in the Argentinian northwest. Kinds of energy use within this region are mainly electricity and other alternate fuels like liquefied oil gas fractioned into cylinders [13]. Within consumption spots, natural gas is utilized primarily for heating systems, then for cooking and hot water in the Residential, Business and Public sectors as well as in Industry. Within the Industry sector, heat can be used for direct heating or to produce steam or hot water. It is also utilized in the production of electric energy in the thermolectric stations mentioned earlier. It is explained that natural gas arrives consumers as hydrocarbon in order to perform combustion in its final use.

1.4 __ SECONDARY ENERGY GENERATION, TRANSPORTATION AND DISTRIBUTION

Forty-five private and state companies produce 96% of the generated electricity [11]. The percentage in public domain refers to nuclear generation and the two binational hydroelectric plants, Yacyretá (Argentina-Paraguay) and Salto Grande (Argentina-Uruguay) and what is left is private. The generation sector is highly fractionated and is distributed among all the other power stations.

Coming from different sources and after being generated and injected into SADI, electric energy is transported and distributed. Electric energy transmission and distribution is a duty for the private sector, which is formed by a State-regulated monopoly.

If we mention natural gas, its production takes place through the extraction of sedimentary basins and future processing in treatment plants. Presently, the sedimentary basins producing are Cuencas Norte, Cuyana, Neuquina, San Jorge y Austral [14]. On a later phase, it is distributed to the demanding regions which are connected by a pipeline system.

After refinery treatment, other natural gas derived fuels and the ones derived from petroleum are transported into service stations. Later, they are commercialized, stored or consumed. Among them, we have liquefied oil gas, naphtha, gasoline. Gasoil and other byproducts.

Firewood is harvested from native forests or from plantation areas. After being collected, the wood is processed in coal burners and converted into charcoal, the final shape for consumption.

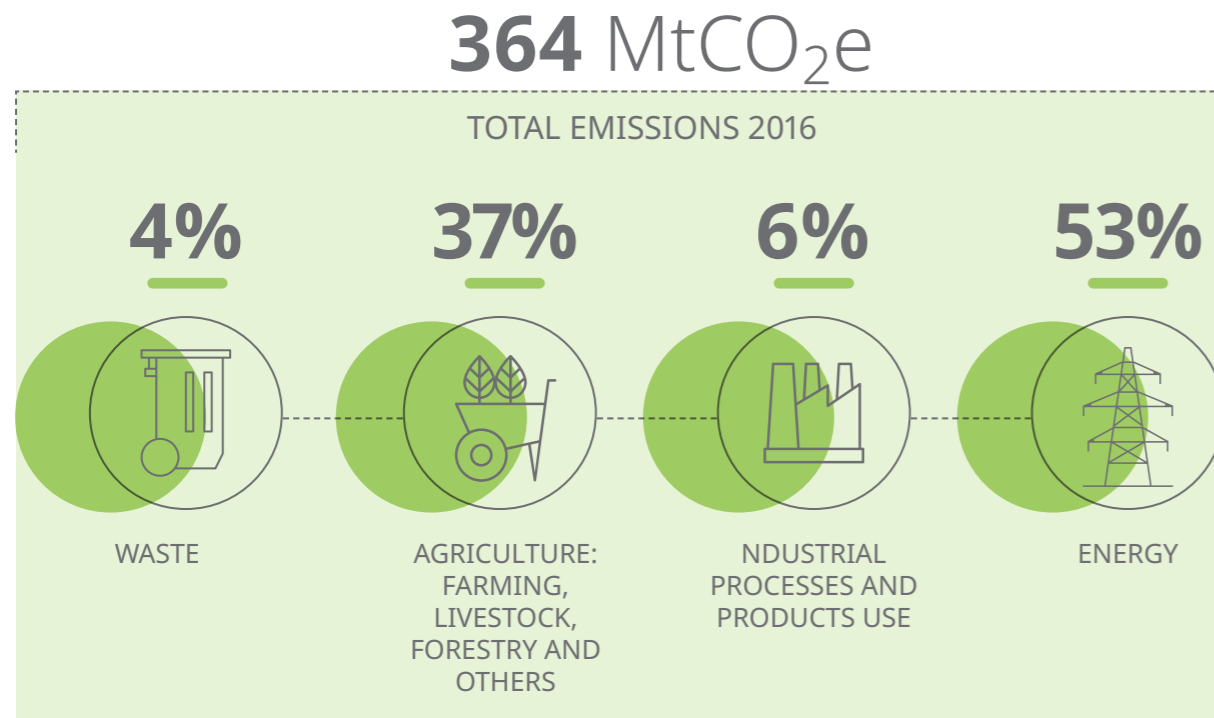
Bioethanol and biodiesel are the two biofuels we produce. In order to have bioethanol, we need to process sugar cane and corn alcohol in a distillery. Whereas, in order to have biodiesel, we need to process the oil coming from oily plants. Both byproducts are sent to refineries for further mix with fossil fuels.

Finally, natural carbon is used as fuel in thermoelectric stations or in coking power stations, where its use is not in producing energy but in being part of some processes within iron casting or electrodes making. In chapter 4, we present a few more details.

1.5 ENERGY CONTRIBUTION TO GHG EMISSIONS

According to the latest GHG inventory organized by Secretaría de Ambiente y Desarrollo Sustentable de la República Argentina in the year 2016 [3], Argentina emitted a total of 364 MtCO_{2e}. The energy sector is the main contributor to emissions, being responsible for 53.1%. In second place is the agriculture sector, with 37.2%. Total distribution can be seen in Figure 7:

Figure 7: Total GHG emissions distribution in 2016.



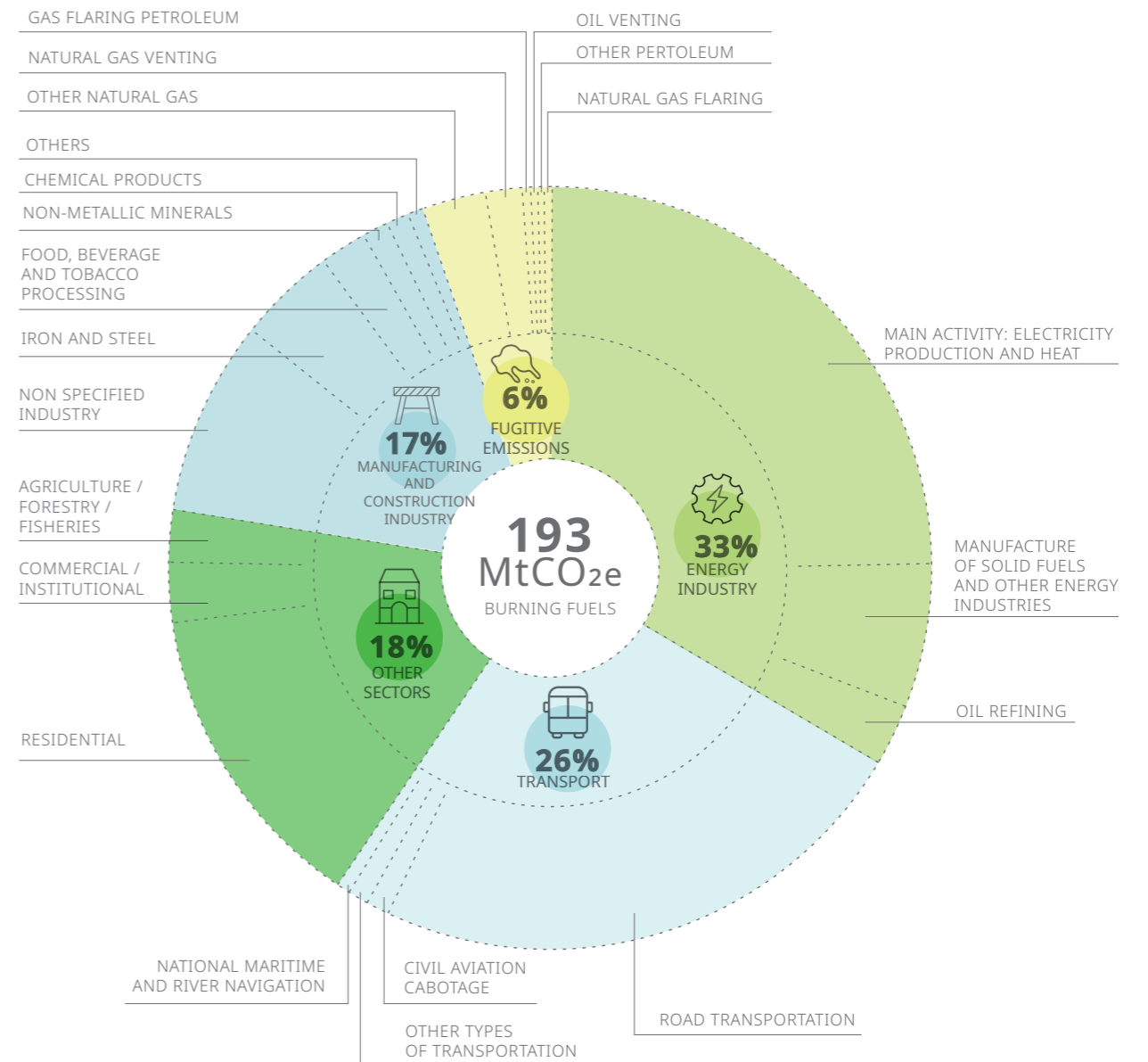
Source: Ministerio de Ambiente y Desarrollo Sostenible, 2016.

Within the energy sector, 33% of emissions (193 MtCO_{2e}) come from energy industries, 26% from transportation sector, 18% from other sectors, 17% from manufacturing and construction industries and 6% from fugitive emissions coming from hydrocarbon production [7].

One of the mitigation measures related to electricity is the utilization of distributed generation drawn from renewable energy. Within this realm, law nr 27.191/2015 establishes phases for total renewable sources contributions. Therefore, it might reach 20% of total generated electric energy by 2025.

Figure 8 shows more details of the aforementioned values:

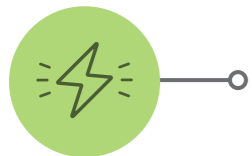
Figure 8: Total GHG emissions distribution within the energy sector in 2016.



Source: Ministerio de Ambiente y Desarrollo Sostenible, 2016.

1.6 RELATED ACTIONS FOR THE REDUCTION OF GHG EMISSIONS

Sectorial plans and NDC indication guide grouped actions aimed at attaining such objective. Measures are classified as unconditional when foreseen as attainable through domestic efforts. On the other hand, they are called conditional when there is the need for external financing additional support. Those are the measures described in the NDC:



ENERGY

which includes all GHG emissions coming from combustion of fuels with energy purposes and fugitive fuels [15].

The proposal for avoided emissions is of 77 MtCO_{2eq} related to unconditional measures and 24 MtCO_{2eq} to conditional measures in view of the following actions referring to energy supply and demand:

- “energy efficiency (efficient heaters, efficient appliances, utilization of heat pumps, utilization of water savers, improvement of public lighting, improvement of residential lighting and improvement of buildings thermal enclosure);
- renewable energies (heaters, electricity generation coming from non-conventional renewable sources connected to a power network, distributed electricity generation, electricity generation isolated from a power network);
- fuels: increase biofuels participation;
- large scale generation (nuclear, hydroelectric, fossil fuel substitution for natural gas in electricity generation and thermoelectric stations efficiency improvement).”



TRANSPORTATION [16]

We plan total avoided emissions of 5.9 MtCO_{2eq} and a cumulative savings of 13.300 million liters of diesel (between 2011 and 2030) if the following actions are taken:

- “passenger inner-city transportation (railway prioritization, low emission mobility development, no-motorized mobility development, public transport prioritization);
- passenger intercity transportation (railway rehabilitation and air transportation fleet modernization);
- cargo transportation (cargo transportation efficiency improvement and railway prioritization).”



INDUSTRIA [17]

We plan to have avoided emissions composed by 6.4 MtCO_{2eq} in unconditional measures and 2.9 MtCO_{2eq} in conditional measures if the following actions are taken:

- “power efficiency (efficient motors, industrialized building systems, industrial lighting, exhibitors, refrigerated products, current recuperation within petrochemical industry and efficiency in resources within food industry);
- Renewable energies (solar photovoltaic and wind power, biogas generation, thermal solar energy and use of black liquor).”



AGRO [18]

Among the sectoral plans, the fourth one is the Plan de Acción Nacional de Agro y Cambio Climático (National agro and climate change action plan). Within this proposal, avoided emissions reach 25.74 MtCO_{2eq}. Here is also where we find success in the mitigation measure called agroenergy, which counts with a reduction of 3.41 MtCO_{2eq} by 2030. The mitigation measure refers to “the use of biomass for energy generation”, which technically means electricity not connected to the network because of biomass use.

02 ENERGY FORECAST

The purpose of this chapter is to inform forecast values in consumption and production of primary energy and energy carriers.

2.1 __ ENERGY SCENARIOS 2030

In 2019, the Energy Planning Department elaborated a document called Energy Scenarios 2030 [19], having as purpose to provide information to all actors involved in the sector.

Within this report, four demand scenarios are presented: a “trendy” one and a “efficient” one. There is the group of “existing policies” on the one hand and the group “active policies” on the other. Within those groups, there is “electrification” and “gasification”. Thus:

Existing policies:

- Trendy: demand is modelled considering behavior in the past few years, according to top-down and bottom-up estimates.
- Efficient: here efficient energy policies in progress would impact trendy demand.

Active policies:

- Electrification: a larger penetration of electric energy in households and in motor vehicles is considered.
- Gasification: strong investment in intensive gas industries is assumed due to larger resource availability and larger natural gas utilization in transportation.

In terms of supply, four natural gas production scenarios are defined and they are directly related to the aforementioned demand scenarios. Moreover, it is possible to define petroleum production scenarios very much related to two possible international prices trajectories. Through these scenarios, we quantify primary and secondary energy generation, as well as its consumption and demand.



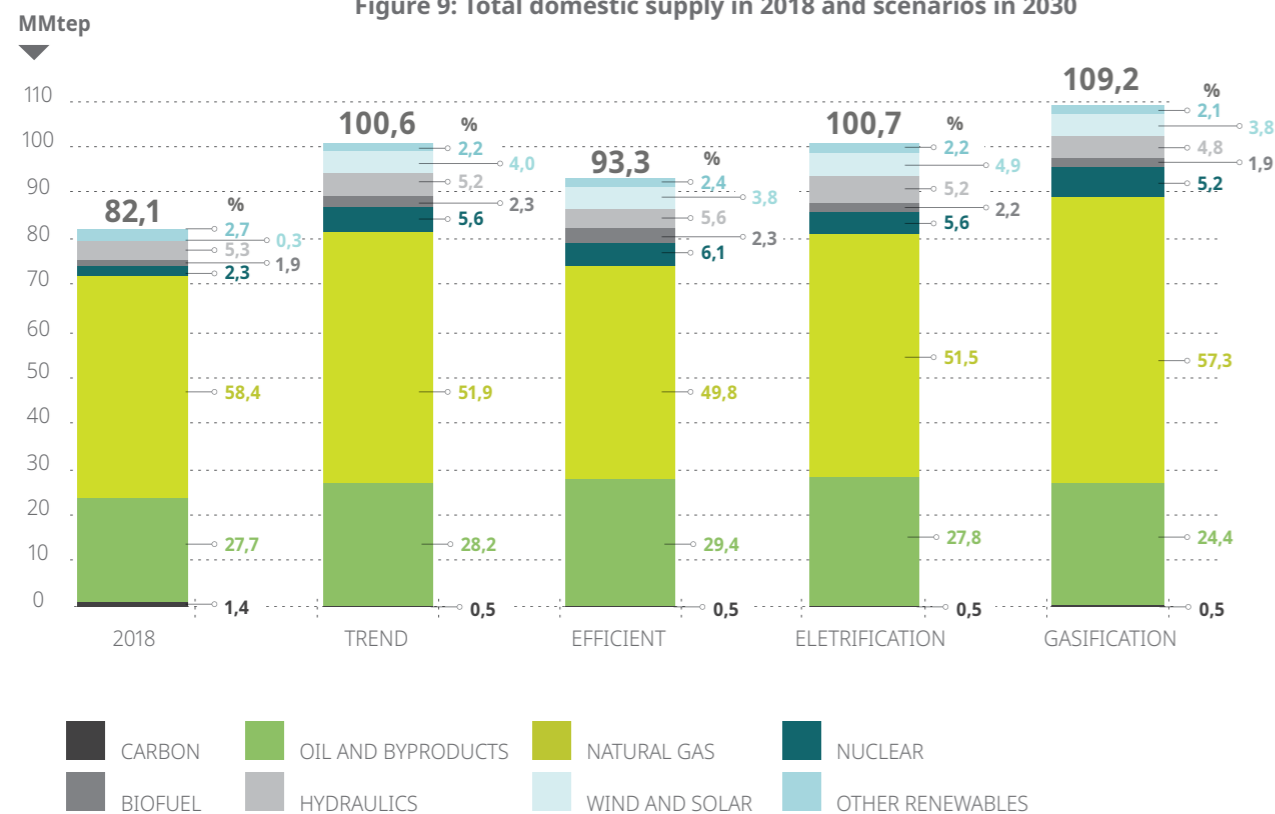
Within the scenarios above, we are able to develop an analysis together with the impact on sub-sectoral policies. Those exercises allow for the construction of an overview on the energy matrix different trajectories according to the impact on energy efficiency, diversification, renewable energies larger penetration and non-conventional hydrocarbon resources massive development.

The main variables used to construct the energy scenarios on a national level are: (i) GDP growth trajectory; (ii) households total number increase; (iii) households with natural gas connection total quantity; (iv) daily degree deficits in heating per province; and (v) motor vehicles sector growth.

2.2 ENERGY GENERATION PROJECTIONS

2.2.1 TOTAL DOMESTIC SUPPLY PROJECTIONS

In view of the numbers published in the 2018 National Energy Report (which was used as basis of the construction of the document Energy Scenarios 2030), Figure 9 shows the projected energy total domestic supply for the year 2030 in each one of the demand scenarios [19]:



Source: Secretaría de Gobierno de Energía, 2019.

As mentioned earlier, petroleum and natural gas are the main resources in primary energy. Based on projections, growth in both resources for the year 2030 requires increases described in Table 1 below [19]:

Table 1: Projections for the increase of natural gas and petroleum according to scenarios.

NATURAL GAS			PETROLEUM		
TYPE OF SCENARIO	[% p.a]*	[MMM3/D]**	TYPE OF SCENARIO	[% p.a]	[BP/D]***
Trendy	+4.9	229	Average price	+5.2	899
Efficient	+4.1	211			
Electrification	+5.1	233	High price	+7.0	1105
Gasification	+5.9	258			

*variation per annum in percentages. **million cubic meter per day. ***million barrel per day.

Source: Secretaría de Gobierno de Energía, 2019.

2.2.2 ELECTRICITY GENERATION PROJECTIONS

According to power revenue projections for electric generation to the system by 2030, here are the calculated values [19]:

Table 2: Cumulative new installed capacity by 2030.

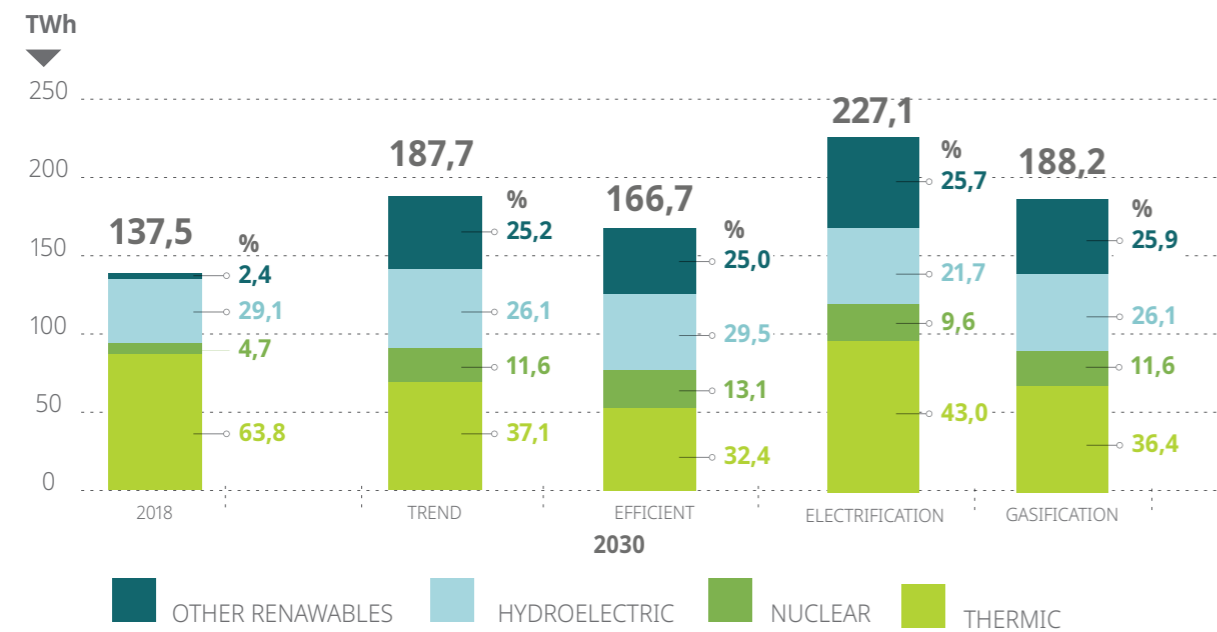
SOURCE/ SCENARIO	TRENDY [GW]	EFFICIENT [GW]	ELECTRIFICATION [GW]	GASIFICATION [GW]
Renewables	13.7	12.2	17.8	14.4
Nuclear	1.3	1.3	1.3	1.3
Hydroelectric	2.5	2.5	2.5	2.5
Thermal	4.2	3.5	7.1	4.0
TOTAL	21.7	19.5	28.7	22.2

Source: Secretaría de Gobierno de Energía, 2019.

Therefore, in regards to the trendy and efficient demand scenarios, our interpretation is that the incorporation of savings measures as well as of energy efficient utilization would demand 2.2 GW less than in the trendy scenario, where 1.5 GW represent the renewable origin capacity. In turn, the electrification demand scenario presents an additional difference of 6.5 GW in relation to the gasification scenario, from where 3.4 GW are from renewable origin.

Generated electric energy coming from primary sources in line with new capacity contributions by 2030 are described in Figure 10 (for each one of the scenarios):

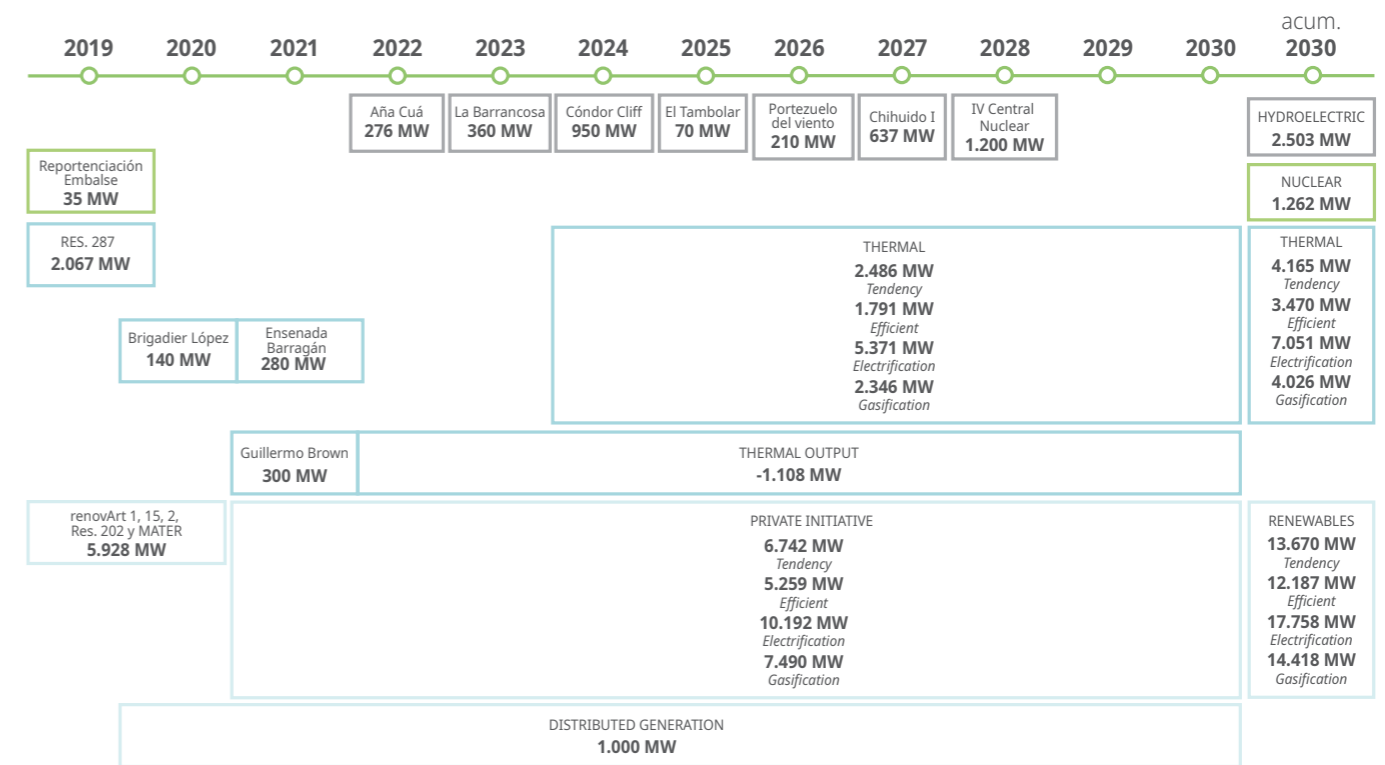
Figure 10: Compared results by scenario and generation mix.



Source: Secretaría de Gobierno de Energía, 2019.

As illustrated, for each one of the four demand scenarios, we would be covering at least 20% in renewables participation within the total of electric energy production, thus, complying with Law nr. 27.191. This way, we would succeed in decarbonizing this production, managing to reduce, at least in 20%, the incidence of natural gas. The final outline for installed capacities by 2030 can be found in Figure 11 [19]. It is also possible to see annual incorporations and exits in thermal power stations (with large participations of renewable origin, both centralized and decentralized distributed generation):

Figure 11: Annual new installed capacity between 2019 and 2030.



Source: Secretaría de Gobierno de Energía, 2019.

2.3 ENERGY DEMAND PROJECTIONS

2.3.1 DESCRIPTION OF DEMAND AND INDICATORS

In accordance with the Sustainable Development Objective 7, which refers to “guaranteeing access to affordable, safe, sustainable and modern energy for all”, the following goals were adapted to the national context:

- Goal 7.1. By 2030, guarantee universal access to affordable, dependable and modern energy services.
- Goal 7.2. By 2030, considerably increase renewable energy proportion within the group of energy sources.
- Goal 7.3. By 2030, double the world rate in energy efficiency improvement.

For the purpose of monitoring those goals, we have adopted a baseline for each indicator, an intermediate goal and a final goal for the year 2030. They are all summarized in Table 3 [19]:

Table 3: Monitoring indicators, baseline, intermediate and final goals

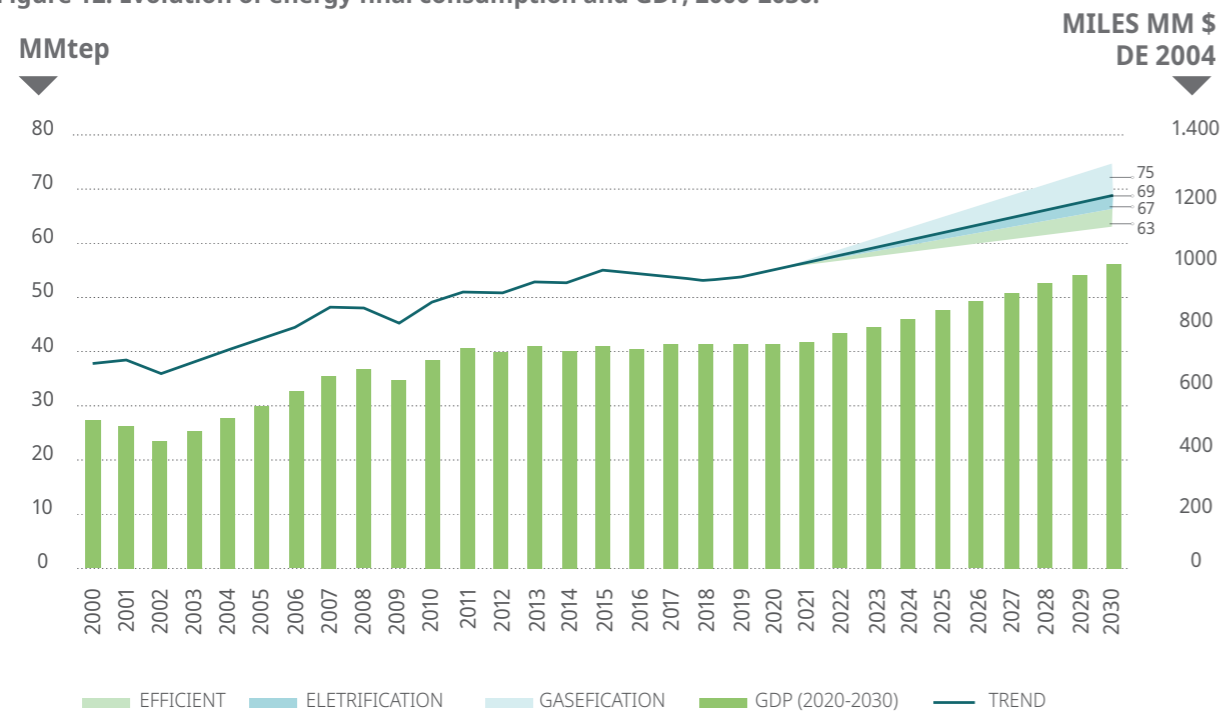
INDICATOR	BASELINE		INTERMEDIATE GOAL		FINAL GOAL
	Year	Amount	Year	Amount	
Population percentage with access to electricity	2010	98.8%	2019	99.3%	99.5%
Population percentage with access to clean fuel for coking	2010	97.2%	2019	97.5%	97.8%
Percentage of renewable energy within total energy consumption	2016	10.3%	2019	10.9%	16.3%
Energy intensity (total energy domestic supply/GDP)	2016	0.120 ktep/MM 2004 ARS	2019	0.115 ktep/MM 2004 ARS	0.098 ktep/MM 2004 ARS

Source: Secretaría de Gobierno de Energía, 2019.

2.3.2 SECONDARY ENERGY DEMAND

In Figure 12 below, we see the evolution of energy final consumption and of GDP by 2030, described in million TOE. All information was based on the demand scenarios: trendy, efficient, electrification and gasification [19]:

Figure 12: Evolution of energy final consumption and GDP, 2000-2030.

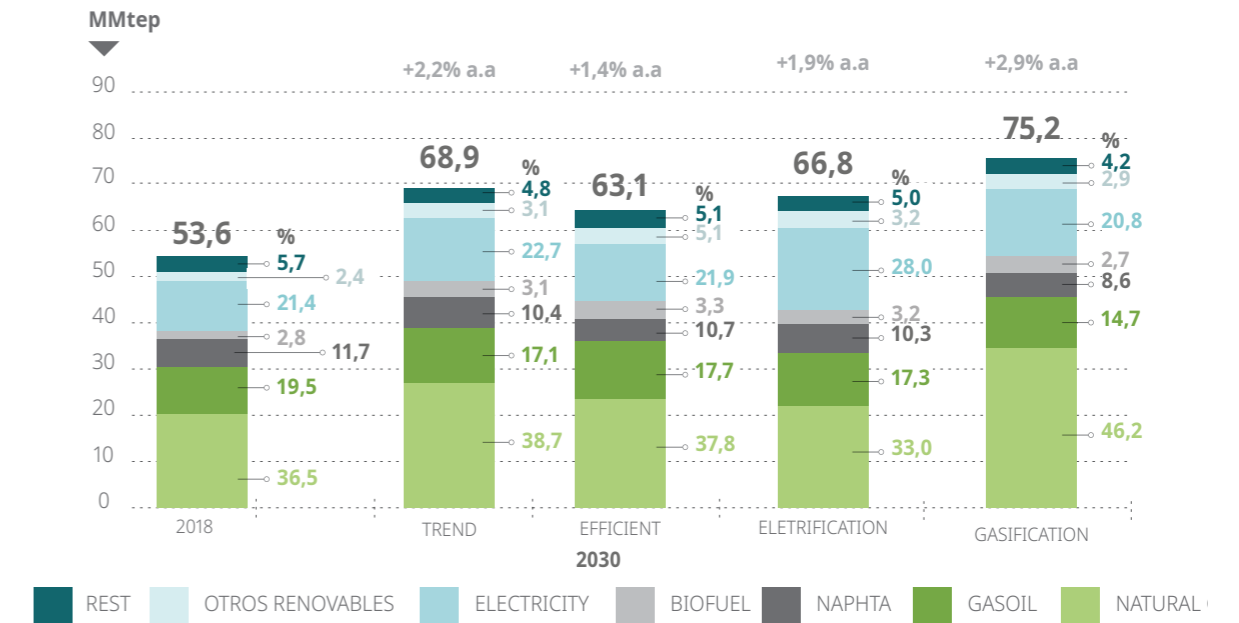


Source: Secretaría de Gobierno de Energía, 2019.

Having in mind Figure 12, in 2030, the efficient scenario will be the one with lower energy consumption in opposition to the gasification scenario. They show a difference of 12 million TOE or, if shown in percentages, the gasification scenario represents 19% larger consumption. The other two scenarios are positioned in between the values shown for efficient and gasification scenarios.

Figure 13 below describes energy final consumption per source for each one of the four demand scenarios in 2030 [19]:

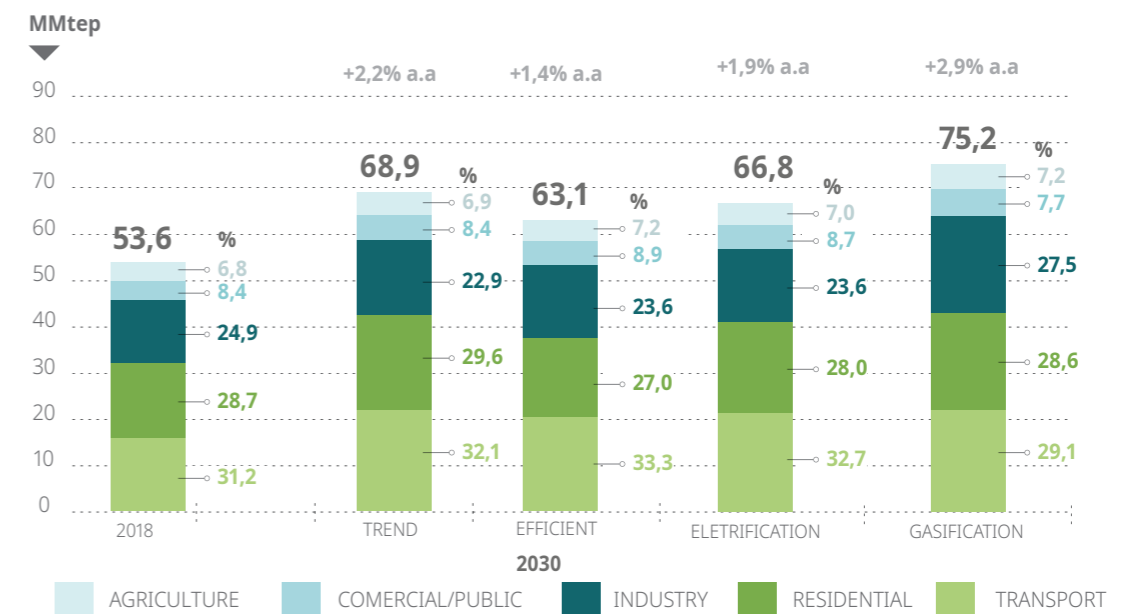
Figure 13: Final energy consumption per source for each scenario in 2030.



Source: Secretaría de Gobierno de Energía, 2019.

Figure 14 completes the idea as it shows energy final consumption per sector for each one of the four demand scenarios in 2030 [19]:

Figure 14: Final energy consumption per sector for each scenario in 2030.



Source: Secretaría de Gobierno de Energía, 2019.

Likewise, Table 4 presents unbundled consumption per secondary energy source for the trendy scenario by the year 2030 [19]:

Table 4: Structure for energy final consumption per sector in demand trendy scenario in 2030.

SOURCE	RESIDENTIAL	BUSINESS AND PUBLIC	TRANSPORTATION	AGRIBUSINESS	INDUSTRY
Electric energy	32.3%	55.2%	0.4%	1.9%	29.9%
Natural gas	56.0%	28.0%	21.4%	10.2%	44.2%
LPG	6.1%	3.5%	0.0%	1.7%	1.1%
Liquid fuels	0.1%	2.0%	68.8%	75.2%	0.8%
Others	5.4%	11.3%	0.0%	11.0%	24.0%
Biofuels	0.0%	0.0%	9.4%	0.0%	0.0%

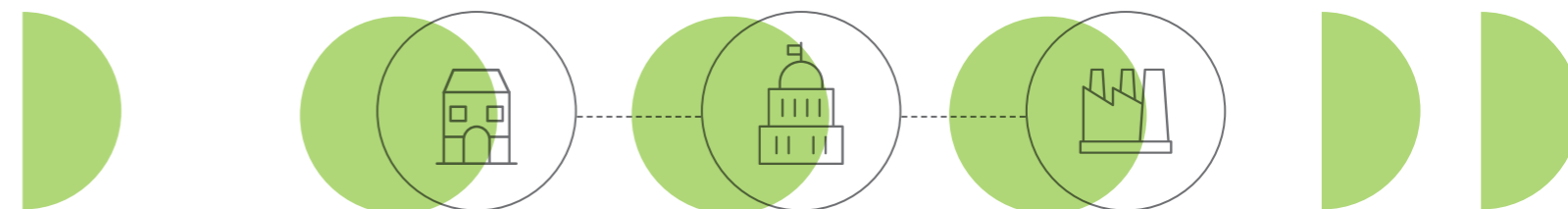
Source: Secretaría de Gobierno de Energía, 2019.

Table 5 describes unbundled consumption per secondary energy source for the efficient scenario by the year 2030 [19]:

Table 5: Structure for energy final consumption per sector in demand efficient scenario in 2030.

SOURCE	RESIDENTIAL	BUSINESS AND PUBLIC	TRANSPORTATION	AGRIBUSINESS	INDUSTRY
Electric energy	29.7%	55.4%	0.5%	1.9%	30.7%
Natural gas	56.8%	27.4%	21.5%	10.7%	42.1%
LPG	7.0%	3.5%	0.0%	1.7%	1.1%
Liquid fuels	0.1%	2.0%	68.6%	74.3%	0.8%
Others	6.5%	11.7%	0.0%	11.4%	25.4%
Biofuels	0.0%	0.0%	9.5%	0.0%	0.0%

Source: Secretaría de Gobierno de Energía, 2019.



It is possible to observe that changes in value in tables 4 and 5 are marginal: (i) within residential sector, the efficient scenario shows a lower use of electric energy, which can be explained by the increase in natural gas, PLG and other fuels related to thermal energy; (ii) business and public sector do not show representative differences for both scenarios as well as transportation and agribusiness sectors; (iii) within the industrial sector, consumption of other fuels (bagasse, firewood, wind, coke and carbon) shows increased participation, natural gas diminishes contribution in a few percentage points and electric energy increases in less the one percentage point. Finally, Table 6 shows values for energy carriers by the year 2030, both in absolute terms and in inter annual changes [19]:

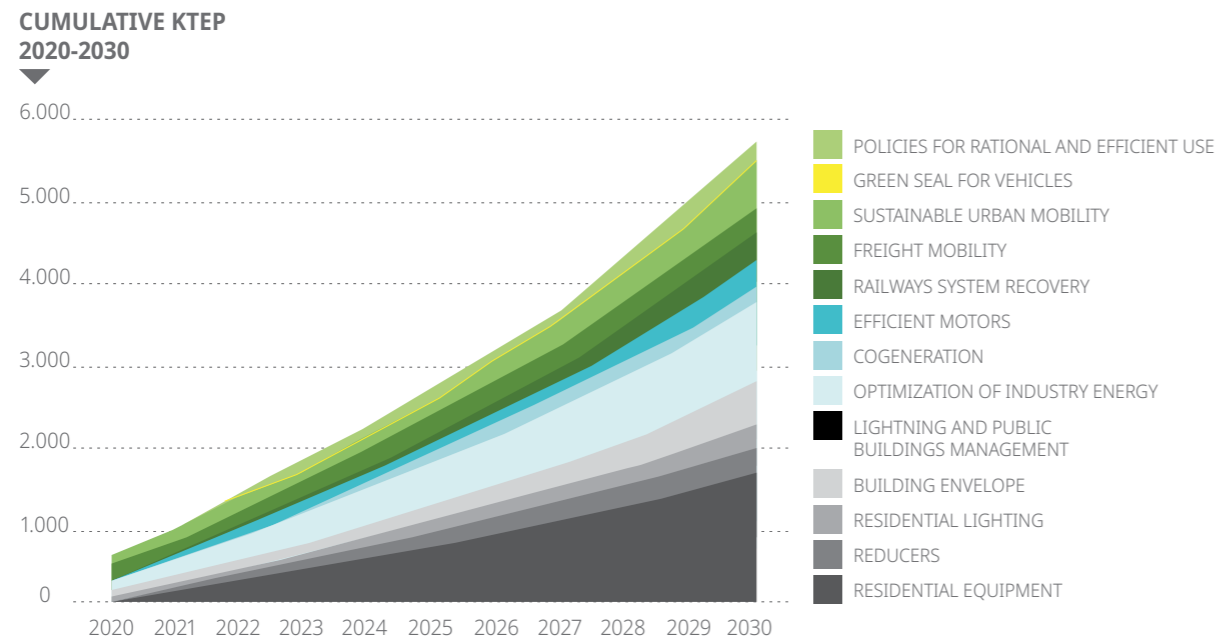
Table 6: Secondary energies demand for each scenario by 2030.

CARRIER	2018	2030			
		Trendy	Efficient	Electrification	Gasification
Electric energy [TWh]	133	182 +2.6% p.a	161 +1.6% p.a	219 +4.2% p.a	182 +2.6% p.a
Natural gas [MMm3/d]	76.4	106 +2.7% p.a	96 +1.9% p.a	90 +1.4% p.a	132 +4.7% p.a
Aerokerosene [kboe/d]	12.0	9.4 -2.0% p.a	9.4 -2.0% p.a	9.4 -2.0% p.a	9.4 -2.0% p.a
Kerosene [kboe/d]	0.24	0.05 -12.3% p.a	0.05 -12.3% p.a	0.05 -12.3% p.a	0.05 -12.3% p.a
Motonaftas [kboe/d]	133.5	157.6 +1.4% p.a	151.3 +1.0% p.a	151.5 +1.1% p.a	142.5 +0.5% p.a
Gasoil [kboe/d]	225.1	258.6 +1.2% p.a	236.4 +0.4% p.a	253.5 +1.0% p.a	242.0 +0.6% p.a
Fueloil [kboe/d]	2.0	0.1 -23.9% p.a	0.1 -23.9% p.a	0.1 -23.9% p.a	0.1 -23.9% p.a
LPG [kboe/d]	32.1	34.7 +0.6% p.a	33.6 +0.4% p.a	34.7 +0.7% p.a	31.9 -0.1% p.a
Biodiesel [kboe/d]	21.0	27.8 2.4% p.a	27.8 2.4% p.a	27.3 +2.2% p.a	26.2 +1.9% p.a
Bioethanol [kboe/d]	11.1	17.6 +3.9% p.a	17.6 +3.9% p.a	17.1 +3.9% p.a	16.0 +3.9% p.a

Source: Secretaría de Gobierno de Energía, 2019.

Based on different policies in terms of energy savings and efficiency and according to sectoral action plans indicated in Chapter 1, initiatives described in Chapter 5, Figure 15 reflects its impact in energy consumption due to such successes [19]:

Figure 15: Cumulative savings according to energy savings and efficiency during the period 2020-2030.

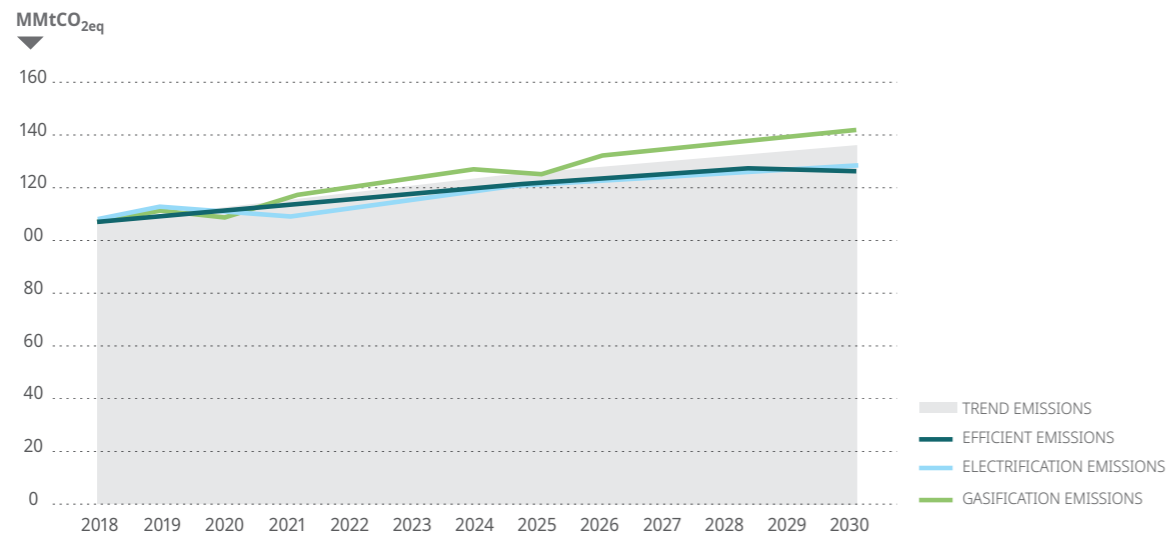


Note: Residential Equipement include label policies and minimum standard

Source: Secretaría de Gobierno de Energía, 2019.

Finally, according to previous projected consumption, Figure 16 reflects GHG emissions (in MtCO_{2eq}) [19]:

Figure 16: Final consumption emissions during the period 2018-2030.



Source: Secretaría de Gobierno de Energía, 2019.

For more details, please check the respective reference.

03 POTENTIAL FOR RENEWABLE ENERGY RESOURCES

Potential The purpose of this chapter is to inform about potential energy renewable sources and their geographic distribution. Water, wind, solar, biomass, biogas and geothermal potential will be presented.

3.1 EVOLUTION OF ELECTRIC GENERATION BY RENEWABLES DURING THE PERIOD 2015-2019

Starting with Laws nr. 27191/2015 and 27424/2017 and later the bidding for the RenovAr project (explained in Chapter 5), it is possible to see a significant growth in electric energy (measured in GWh) due to non-conventional renewable sources injected into SADI, as shown in Table 7 [9]:

Table 7: Evolution of electric generation by non-conventional renewable sources during 2015-2019.

SOURCE/YEAR	2015 [GWH]	2016 [GWH]	2017 [GWH]	2018 [GWH]	2019 [GWH]
Biodiesel	0	1	0	0	0
Biomass	195	193	243	252	299
Wind	593	547	616	1,413	4,996
Hydro Renewable	1,624	1,820	1,696	1,432	1,462
Solar	15	14	16	108	800
Biogas	84	58	64	145	255
Total [GWh]	2,510	2,635	2,635	2,350	7,812

Source: CAMMESA Annual Report, 2019.

3.2 __ POTENTIAL FOR RENEWABLE ENERGIES

3.2.1 HYDRO RESOURCE

Argentina has a yearly average water flow higher than 26.000 m3/s that can be utilized for electric energy generation. However, the distribution of such resource is rather irregular due to diverse geographical characteristics and diverse climate within its territory.

A percentage of 85% of superficial waters represent the Río de la Plata sedimentary basin, integrated by rivers Pilcomayo, Bermejo, Paraná, Paraguay, Iguazú, Uruguay sub-basins and other sub-basins that extend towards the territories of Bolivia, Brazil, Paraguay and Uruguay. resources spread throughout north, central and south zones within continental territory. Figure 17 shows the geographic distribution of the resource [20].

Figure 17: Map of hydro resources in Argentina.

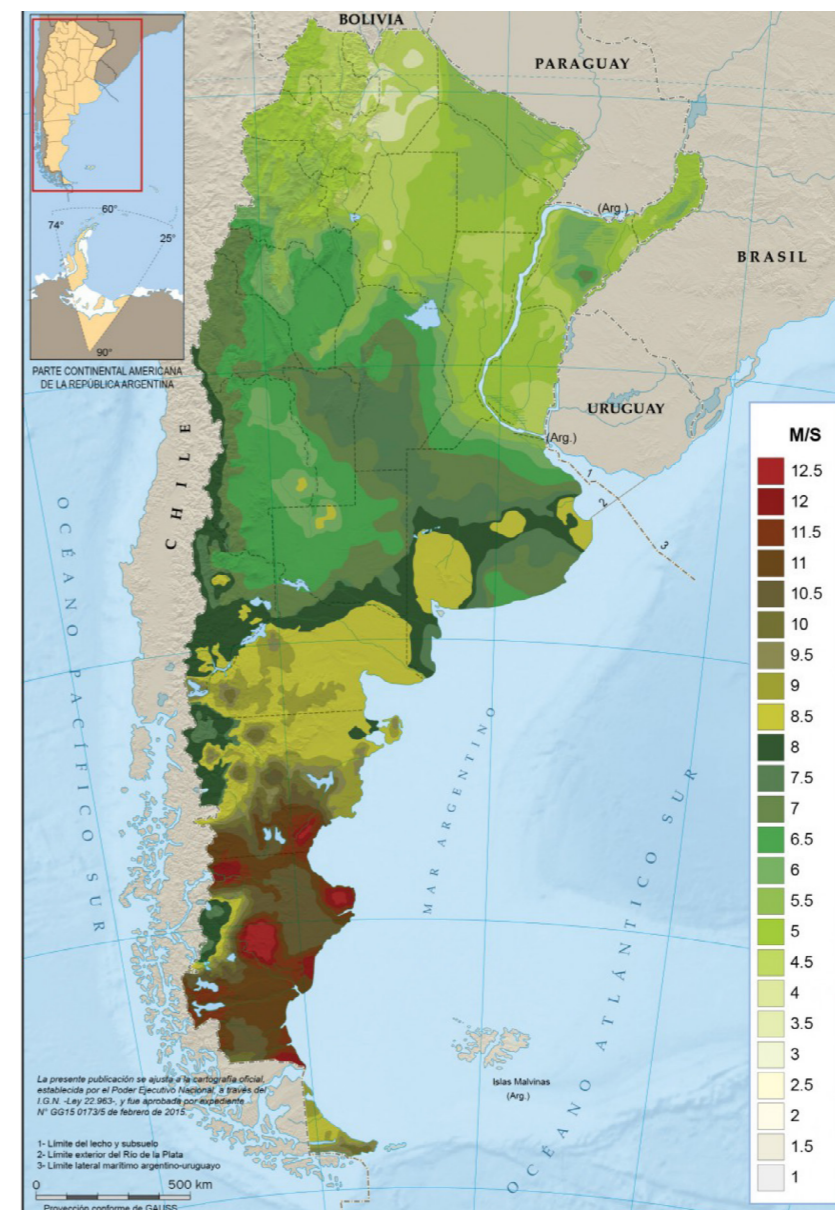


Source: Energías de mi País (educ.ar), 2016.

3.2.2 WIND RESOURCE

Argentina is one of the countries with greater wind potential. In the Patagonia region wind blows in an intense and frequent manner, in a speed which exceeds twice the necessary minimum for electricity generation. Besides Patagonia, the Atlantic coast and the mountains in the province of Buenos Aires provide great intensity winds. The Andean region is also a highlight in terms of great wind potential. Wind speeds range from 5.5 m/s to 12.5 m/s. Figure 18 provides the geographic distribution for this resource [20].

Figure 18: Map of wind resource.



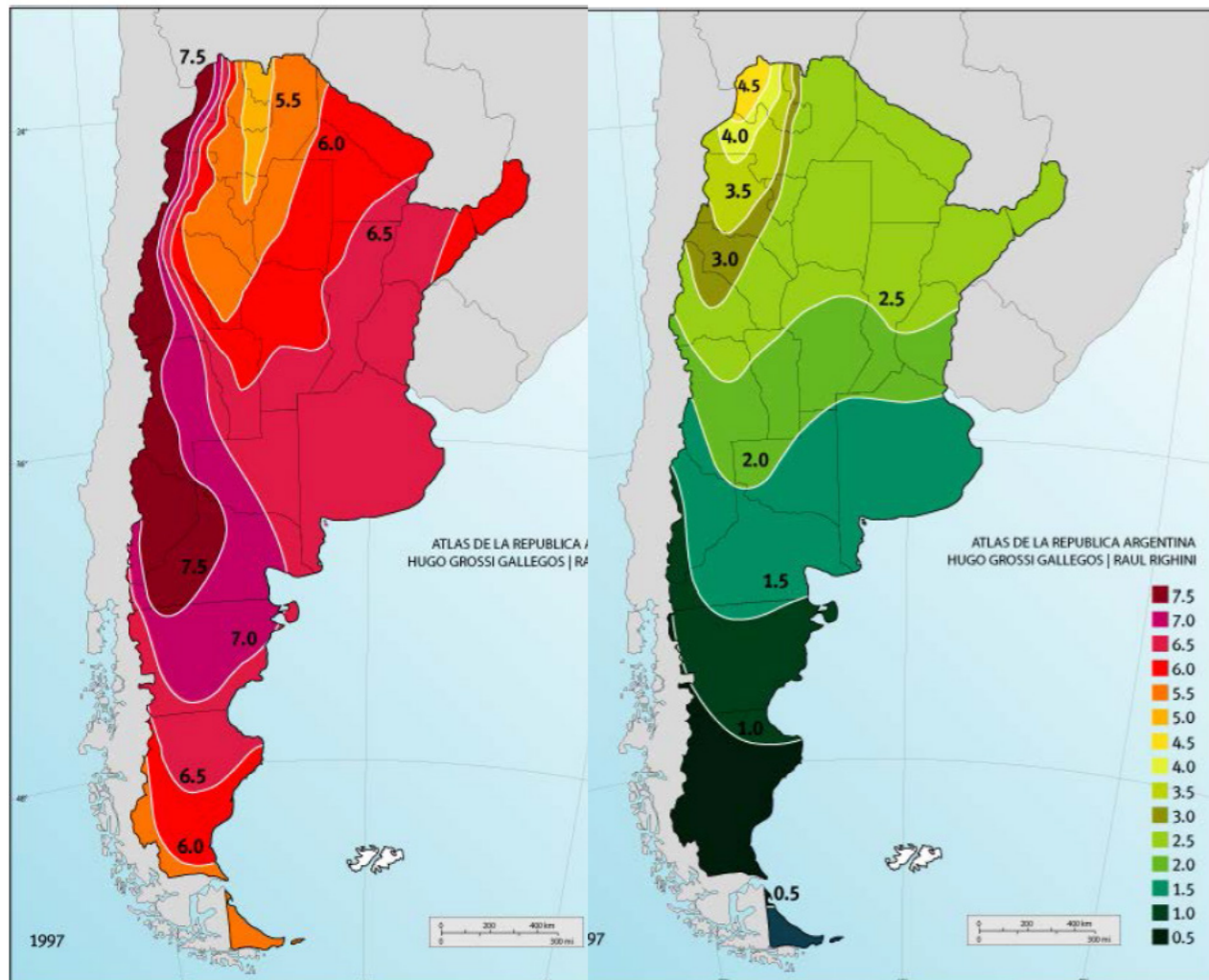
Source: Energías de mi País (educ.ar), 2016.

3.2.3 SOLAR RESOURCE

Given the extension of the Argentinian territory and given the fact that the availability of solar resource is a variable dependent on space and time [21], Figures 19 and 20 display daily global irradiation on a horizontal plan in January and June and in kWh/m².

Figure 19: Distribution of solar resource in January.

Figure 20: Distribution of solar resource in June.



Source: Atlas de energía solar de la República Argentina, 1997.

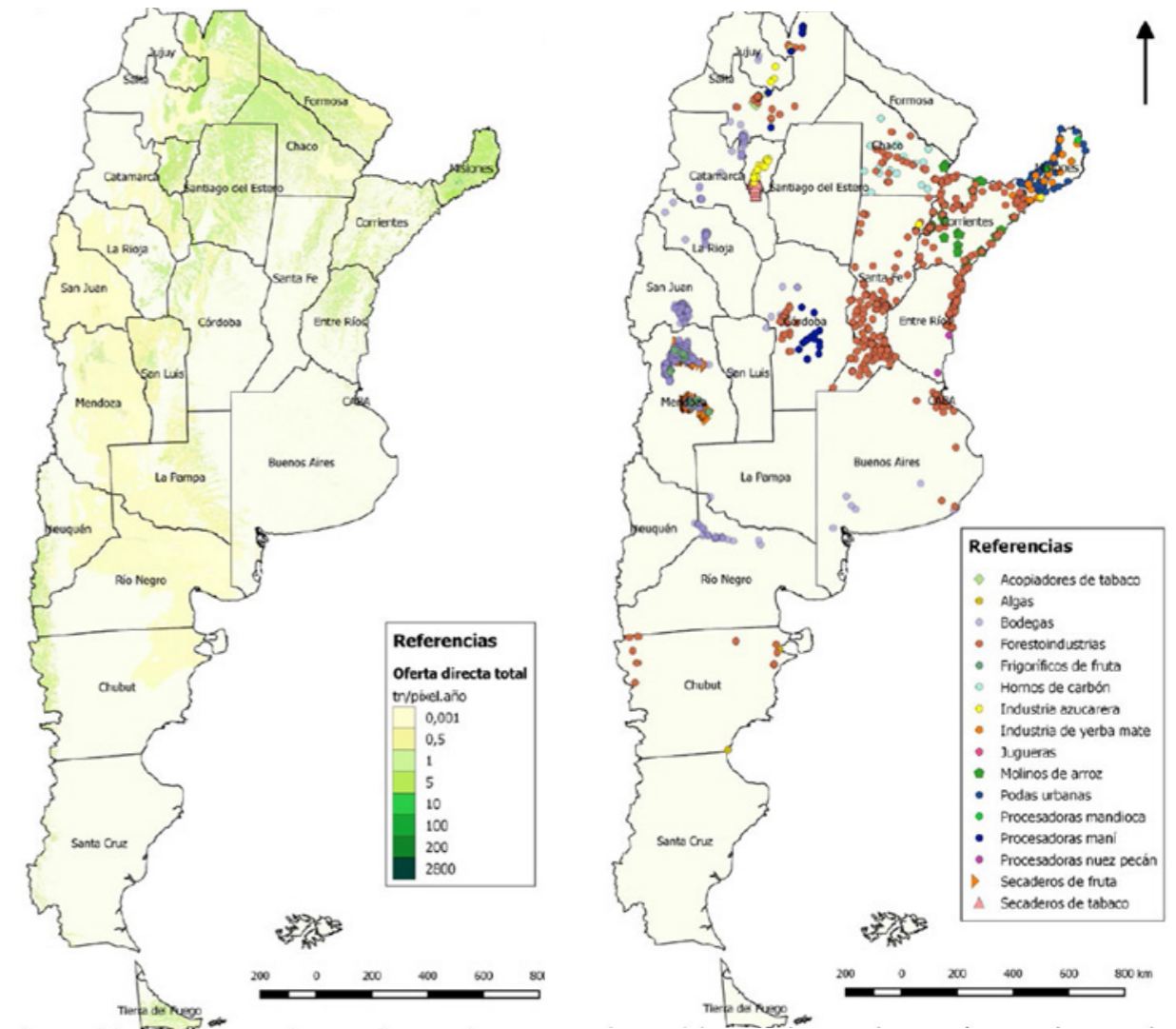
3.2.4 BIOMASS RESOURCE (DRY)

Figures 21 and 22 exhibit total direct and indirect supply in the distribution of dry biomass resource. Direct supply is of native formation; whereas, indirect supply occurs from industrial processing (sugar plants, forestry industry, peanut processors and other industries) [22]

In general terms, this resource is concentrated in the north of the country, where there is an abundance of industries and favorable climate.

Figure 21: Distribution of dry biomass direct supply.

Figure 22: Distribution of dry biomass indirect supply.



Source: FAO and Secretaría de Energía, 2020.

3.2.5 BIOGAS RESOURCE (WET BIOMASS)

The production of wet biomass comes from the use of residues generated by agro industry, bovine and swine livestock industry (in feedlots) and dairy activity. Given the fertility of the Argentinian wet pampa¹, such resource is concentrated in the center of the country. Table 8 summarizes the potential for biogas in the country, in TOE/year [2].

Table 8: Distribution of biogas supply by province.

PROVINCE	FEEDLOTS (TOE/ YEAR)	DAIRY FARMS (TOE/YEAR)	SWINE (TOE/ YEAR)	TOTAL (TOE/ YEAR)
Buenos Aires	65.626	15.252	30.065	110.943
Catamarca	591	64	181	836
Chaco	978	0	2.433	3.412
Chubut	923	6	605	1.533
Córdoba	37.380	2.559	28.857	87.246
Corrientes	233	2	789	1.025
Entre Ríos	8.659	2	7.529	16.191
Formosa	0	0	1576	1576
Jujuy	550	2.531	656	3.737
La Pampa	2.470	12	3.823	6.305
La Rioja	2.264	0	984	3.248
Mendoza	1.056	1.028	715	2.799
Misiones	1.997	0	859	2.856
Neuquén	503	0	577	1.080
Río Negro	1.165	12	511	1.688
Salta	8.061	66	2.377	10.505
San Juan	217	210	649	1.076
San Luis	4.174	9	4.518	8.700
Santa Cruz	424	171	62	657
Santa Fe	36.419	20.511	21.727	78.657
Santiago del Estero	7.242	1.033	749	9.024
Tierra del Fuego	85	2	10	97
Tucumán	2.953	152	675	3.780
TOTAL	184.420	61.625	110.928	356.973

Source: FAO and Secretaría de Energía, 2020.

1- Pampa is the name given to the region involving Buenos Aires province, center and south of Santa Fe province, south and Midwest of Cordoba province and the eastern most third of La Pampa province. Those areas are comprised of prairies with temperate climate and flat relief and their pluviometric regime is of 500 mm/ly.

3.2.6 GEOTHERMAL RESOURCE

There are more than three hundred spots with geothermal features; however, only four present potential for electricity generation. Copahue, located in the west of Neuquén province, is the country's most advanced project. That is where we can find a pilot geothermal central of 10MW, opened in 1988. Within this same province, we have the Domuyo geothermal park, where heat is produced in the shape of fumaroles, hot springs and gases. The two other areas that present potential and that are under investigation for future possibilities are Tuzgle, in Salta and Jujuy as well as Valle del Cura, in San Juan. It is estimated that Argentina has a geothermal potential for electric generation of more than 2000 MW [20]. Figure 23 shows the location of different zones with geothermal potential.

Figure 23: Map of geothermal resources in Argentina.



Source: Energías de mi País (educ.ar), 2016.

04 ENERGY GOVERNANCE

As quantitative information about energy in Argentina has already been presented, the purpose of this chapter is to question the energy governance process within the country. It will address both the organizational structure as well as the respective legal framework.

4.1 ORGANIZATIONAL STRUCTURE



4.1.1 HIGHEST GOVERNING BODY

Secretaría de Energía is the institution that regulates the energy sector in Argentina since December 10, 2019. Through the decree-law 732/2020 this Department is part of the Ministry of Economy.

The Secretaría de Energía, among its eighteen objectives, is in charge of: (i) national energy policies; (ii) overseeing fuel regime and fixing prices; (iii) elaborating regulation policies for public services within energy area and supervising control agencies; (iv) operating as Application Authority for regulation in progress in the energy realm; (v) promoting sectoral policy that fosters rational exploitation of resources and environment protection; (vi) promoting the utilization on new energy resources, the incorporation of the hydroelectric supply and research in both fields; (vii) being a representative in the Consejo Federal de la Energía Eléctrica; (viii) understanding the definition for nuclear policy; and (ix) exercising protective control over the Ente Nacional Regulador de la Electricidad (ENRE), the Ente Nacional Regulador del Gas (ENARGAS), the Unidad Especial del Sistema de Transmisión de Energía Eléctrica (UESTEE, before UESTY, referring to Central Hidroeléctrica Yacretá) and the Comisión Nacional de Energía Atómica (CNEA) [23].

In regard to agencies, there is the Subsecretaría de Hidrocarburos, the Subsecretaría de Energía Eléctrica, the Subsecretaría de Planeamiento Energético and the Subsecretaría de Coordinación Institucional. Each agency has a national and a local Board of Directors [24].

Through the Decree nr.854 from 2017, the Consejo Federal de Energía was created to be the highest governing body nationally speaking. Among its duties, there is: (i) the planning and development of national energy sector and the consultancy

over changes on the energy legislation; and (iii) the provision of support to the Poder Ejecutivo Nacional and the provinces [24].

Given the existing resources based on hydrocarbon, the aforementioned natural gas is of extreme relevance as it is the electric aspect. Similarly, considering the geographic distribution, generation, transportation and distribution activities are entitled to private or mixed entities (in other words, with state participation) regulated by state agencies belonging to Secretaría de Energía.



4.1.2 ABOUT GOVERNANCE IN ELECTRIC ENERGY

4.1.2.1 NATIONAL AGENCIES IN ELECTRIC ENERGY:

The ENRE is an autarchic agency in charge of regulating electric activity and controlling businesses within the sector (generators, transporting and particularly Edenor and Edesur distributors) so they comply with their obligations as stated in the Regulatory Framework and in the Concession Contracts [25].

CAMMESA is the acronym for Compañía Administradora del Mercado Mayorista Eléctrico. Its main duties comprise the coordination of clearance operations, the responsibility of fixing wholesale prices and the administration of finance transactions made through SADI [26].

It is a private company with public purpose. Its stock is property of Agentes del Mercado Mayorista Eléctrico in 80% (comprised in equal parts of Agentes Generadores -AGEERA-, Transportistas -ATEERA-, Distribuidores -ADEERA- and Grandes Usuarios -AGUEERA-); the remaining 20% are held by the public ministry who represents the general interest of captive users. It acts as proxy of the many actors in MEM in what refers to capacity and energy placement, organization and leadership on the use of transportation facilities in the spot market. It also acts as commercialization agent for capacity and energy coming as imports and for binational enterprises. In addition, it manages billing, payment or accreditation of the transactions made among actors from MEM. Its behavior is monitored by Subsecretaría de Energía Eléctrica" [26].

The Consejo Federal de la Energía Eléctrica manages specific funds whose single destination is the electric sector and advises the Poder Ejecutivo Nacional and Gobiernos Provinciales in what refers to the electric industry. It also advises on changes required by legislation on the electric industry. Its president is the Secretario de Energía de la Nación (or the Subsecretario de Planeamiento Energético as alternate) and two representatives (main one and alternate) for each one of the Argentinian Provinces. Those last two are nominated by the Poderes Ejecutivos Provinciales and assigned by the Poder Ejecutivo de la Nación [27].

4.1.2.2 AGENCIES RELATED TO THE REGULATION OF BINATIONAL POWER STATIONS:

Argentina shares the Complejo Hidroeléctrico Salto Grande (CHSG) with Uruguay. CHSG is regulated by the Comisión Técnica Mixta de Salto Grande. This is a binational agency created by both countries in order to take advantage of the currents of Uruguay river in Salto Grande area [28].

In order to take advantage of Paraná river, Argentina shares Central Hidroeléctrica Yacretá-Apipé with Paraguay. For that matter, the Entidad Binacional Yacretá was created. Both countries have equal participation [29].

The company in charge of commercializing the energy generated by those power stations is the Emprendimientos Energéticos Binacionales Sociedad Anónima. EBISA is state owned and is in charge of selling the generated electric energy through international connections and binational agreements [30].

4.1.2.3 AGENCIES RELATED TO THE DEVELOPMENT OF ELECTRIC ENERGY OF NUCLEAR ORIGIN:

CNEA is a governmental agency in charge of nuclear energy research and development. Argentina has three operating nuclear power stations (Atucha I, Atucha II y Embalse). Those generators are operated by Nucleoeléctrica Argentina S.A. (NASA), which is responsible for supervising nuclear projects in the country [31].

NASA is a private corporation whose share capital is divided among Ministerio de Economía (79%), CNEA (20%) y EBISA (1%) [31]. In order to guarantee uranium dioxide provision to the stations Atucha I and Embalse, the State has created Dioxitek S.A.. This company is owned by Ministerio de Desarrollo Productivo (51%), CNEA (48%) and Gobierno de la Provincia de Mendoza (1%) [32].

The electric energy produced by the three power stations is injected into SADI.

4.1.2.4 AGENCIES RELATED TO ELECTRIC ENERGY ON THE SUBNATIONAL LEVEL:

As mentioned earlier, 96% of the generated electricity (and injected into SADI) is produced by forty-five companies. The state companies are the ones related to binational entities and nuclear power plants. The remaining ones are private. The generation sector is well distributed in terms of participation. Those generator companies are grouped into AGEERA, (Asociación de Generadores de Energía Eléctrica de la República Argentina) [11].

After being generated and injected, electric energy is transported and distributed. The ten companies responsible for transportation are grouped into ATEERA (Asociación de Transportistas de la Energía Eléctrica de la República Argentina) [33]. Likewise, those forty-eight companies in charge of distributing are grouped into ADEERA (Asociación de Distribuidores de la Energía Eléctrica de la República Argentina) [34]. All the companies that form both associations are of private nature. However, they are part of a monopoly regulated by the State.

ADEERA is comprised of electric energy distributors who supply the provinces, both as companies and as cooperatives.

4.1.3 ABOUT GOVERNANCE IN TERMS OF HYDROCARBONS



4.1.3.1 AGENCIES RELATED TO NATURAL GAS ON THE NATIONAL LEVEL:

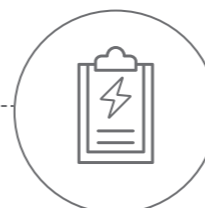
The Ente Nacional Regulador del Gas (ENARGAS) is an autarchic agency which has been created for the purpose of regulating, controlling, supervising and resolving controversies inherent to the relationship with transportation public service and gas distribution within the country [35].

Once extracted from basins and treated in refineries, natural gas is transported towards north or south through private transportation companies. The Transportadora de Gas del Norte S.A. (TGN) is the one which transports natural gas through high pressure pipelines in the center and north of the country [36]. In turn, Transportadora de Gas del Sur S.A. (TGS) connects reserves from the basins of Neuquina, San Jorge and Austral in order to supply south and center of the country, including Greater Buenos Aires and the Ciudad Autónoma de Buenos Aires [37].

From the pipelines belonging to both transportation companies, other existing pipelines supply distributors in other provinces and/or regions. As with ADEERA, the seven gas distributors are grouped into Asociación de Distribuidoras de Gas (ADIGAS) [38].

4.1.3.2 AGENCIES RELATED TO HYDROCARBONS ON THE NATIONAL LEVEL:

YPF S.A. is responsible for exploration, exploitation, distillation, distribution and production of electric energy, gas, petroleum and hydrocarbons derivatives as well as selling of fuels, lubricants, fertilizers, plastics and other industry-related products. The company stock is mixed, 51% of shares belong to the State and 49% is



WE PRESENT BELOW A LIST OF NATIONAL LEGISLATIVE TOOLS THAT REGULATE AND/OR ENABLE RENEWABLE ENERGIES AND ENERGY EFFICIENCY DEVELOPMENT.

available on the Buenos Aires and the New York Stock Markets [39]. Due to such quality, its work practices blend into government agencies' decisions.

Among YPF business units, the following are related to energy: fuels, lubricants dispensed in service stations, LPG fractioning and distribution, oil and gas as well as fuel oil. Besides that, it has its own division in terms of renewable energies (YPF Luz), whose partners are YPF (75.01%) and General Electric (24.99%) [40].

It holds a leading position in Latin America in what refers to the production of non-conventional resources after the development of site Loma Campana (Vaca Muerta).

4.2 NATIONAL LEGAL FRAMEWORK

4.2.1 SELECTION CRITERIA

We present below a list of national legislative tools that regulate and/or enable renewable energies and energy efficiency development. The list includes those documents related to environmental norms.

The chosen selection criterion involves existing laws from before the year 2015, which served as basis for the development of further tools. The area has seen a boost worldwide. Among different initiatives, we had biddings for projects comprising renewable energy sources, distributed generation and timely compliance with specific objectives.

Results presented on this list are evidence of the growth suffered by renewables installed capacity to electric generation as of year 2017 (shown on the values stated in Table 7, which were about wind use).

One of the most important laws in the field, and which boosted growth, was Law nr 27191. It proposes electric energy supply compliance with renewable sources of at least 20% by the year 2025.

It is important to mention that provinces and municipalities were able to develop their own instruments for the promotion of such subjects. Therefore, here we have approached only instruments of national nature.

National Constitution Article 41 is the most important reference as it refers to respect to environmental sustainability and care. It states that it is the Nation's duty to create norms that comprise minimum protection parameters; and that it is the provinces' duty to create complementary norms without altering local jurisdictions. Similarly, its Article 124 establishes that provinces are entitled to the original domain of natural resources existing in their territory [41].

4.2.2 LEGISLATIVE TOOLS RELATED TO RENEWABLE ENERGIES

Table 9 describes legislative tools related to renewable energies:

Table 9: National legislative tools for renewable energy.

TOOL	NR.	SANCTIONED IN YEAR	TITLE
Law	25.019	1998	Régimen Nacional de Energía Eólica y Solar.
Law	25.675	2002	Ley General del Ambiente.
Law	26.093	2006	Régimen de Regulación y Promoción para la Producción y Uso Sustentables de Biocombustibles.
Law	26.123	2006	Régimen para el Desarrollo de la Tecnología, Producción, Uso y Aplicaciones del Hidrógeno como Combustible y Vector de Energía.
Law	26.190	2006	Régimen de Fomento Nacional para el Uso de Fuentes Renovables de Energía Destinada a la Producción de Energía Eléctrica.
Law	26.331	2007	Ley de Presupuestos Mínimos de Protección Ambiental de los Bosques Nativos.
Resolution former Secretaría de Energía	108	2011	Permission for the signing of Contratos de Abastecimiento between the Mercado Eléctrico Mayorista and the supplying of generation availability and associated energy.
Law	27.191	2015	Régimen de Fomento Nacional para el Uso de Fuentes Renovables de Energía destinada a la Producción de Energía Eléctrica. Modificación de Ley 26.190.
Law	27.270	2015	Paris Agreement is approved.
Decree-law	891	2016	Creation of Gabinete Nacional de Cambio Climático.
Decree-law	531	2016	Régimen de Fomento Nacional para el Uso de Fuentes Renovables de Energía Destinada a la Producción de Energía Eléctrica. Reglamentación.
Law	27.424	2017	Régimen de Fomento a la Generación Distribuida de Energía Renovable Integrada a la Red Eléctrica Pública.

TOOL	NR.	SANCTIONED IN YEAR	TITLE
Resolution former Ministerio de Energía y Minería	281-E	2017	Régimen del Mercado a Término de Energía Eléctrica de Fuente Renovable" ("MATER").
Decree-law former Ministerio de Transporte	32	2018	Alteration. Decree-law nr. 779/1995 (electromobility for motorized vehicles with fewer than four wheels).
Decree-law	986	2018	Régimen de Fomento a la Generación Distribuida de Energía Renovable integrada a la Red Eléctrica Pública. Reglamentación.
Resolution former Secretaría de Gobierno de Energía	314	2018	Approval of Implementation norms for Law nr. 27.424, alterations and Decree-law nr. 986/2018.
Disposition former Subsecretaría de Energías Renovables y Eficiencia Energética	28	2019	Normas Complementarias al Régimen de Fomento a la Generación Distribuida de Energía Renovable.
Disposition former Subsecretaría de Energías Renovables y Eficiencia Energética	48	2019	Instrumentación de los Certificados de Crédito Fiscal stated in article 28 of Law 27.424.
Disposition former Subsecretaría de Energías Renovables y Eficiencia Energética	62	2019	Designation of BANCO DE INVERSIÓN Y COMERCIO EXTERIOR SOCIEDAD ANÓNIMA (BICE) as fiduciary of Fondo Fiduciario para el Desarrollo de la Generación Distribuida (FODIS). Approval of Contrato de Fideicomiso del "Fondo Fiduciario para el Desarrollo de la Generación Distribuida".
Disposition former Subsecretaría de Energías Renovables y Eficiencia Energética	83	2019	Approval of process for the issuing of Certificado de Crédito Fiscal del Régimen de Fomento a la Generación Distribuida de Energías Renovables.
Resolution AFIP	4511	2019	Various taxes. Fostering of distributed renewable energy generation integrated to the power network. Law nr 27.424 and its alteration. Certificate of fiscal credit. Electronic bonus. Implementation.
Law	27.520	2019	Presupuestos Mínimos de Adaptación y Mitigación al Cambio Climático Global.

Source: own creation for this document, 2020.

4.2.3 LEGISLATIVE TOOLS RELATED TO ENERGY EFFICIENCY

Table 10 describes legislative tools related to energy efficiency.

Table 10: National legislative tools related to energy efficiency.

TOOL	NR.	SANCTIONED IN YEAR	TITLE
Resolution Secretaría de Industria, Comercio y Minería	319	1999	Adoption of new measures concerning marketing of home appliances that comply with certain features.
Decree-law	140	2007	National Program for the Rational and Efficient Use of Energy.
Disposition Dirección Nacional de Comercio Interior	859	2008	Setting of date for the effect of Resolution nr 319/99 referring to the marketing of home appliances that comply with certain features.
Disposition Dirección Nacional de Comercio Interior	74	2009	Confirmation of granting of notice issued by Instituto Argentino de Normalización y Certificación (IRAM) as a Certification Agency for the enforcement of Disposition nr. 859/08.
Resolution former Secretaría de Energía	1542	2010	Adoption of measures concerning marketing of home appliances that comply with certain features.
Resolution former Secretaría de Energía	1407	2011	Alteration to Resolution nr. 1542/2010 referring to the marketing of home appliances that comply with certain features.
Resolution former Secretaría de Energía	814	2013	Limits for specific energy consumption or minimum energy efficiency. Air conditioning.
Resolution former Secretaría de Energía	228	2014	Limits for specific energy consumption or minimum energy efficiency. Air conditioning.
Resolution by both former Ministerio de Energía y Minería and former Ministerio de Producción	1-E	2017	Grating of special rate for users of electro intensive and ultra-electro intensive industries in view of improvement in energy efficiency measures during productive process.
Bill	S3290-19	-	Energy Efficiency Law

Source: own creation for this document, 2020.

05 NATIONAL PROGRAMS ON ENERGY



The purpose of this chapter is to approach programs and projects finalized or in progress within the areas of renewable energies and energy efficiency as of 2015. This specific year was a turning point due to the creation of the Paris Agreement.

In order to increase renewable sources participation in the domestic energy demand, federal administration has developed a number of programs and projects related to renewable energies. Respective measures are presented by initiatives, according to its energy supply feature, as opposed to energy efficiency, described by program and according to consumption sector.

5.1 __ INITIATIVES RELATED TO RENEWABLE ENERGIES



5.1.1 RENOVAR PROGRAM

RenovAr program was the most important initiative. It was designed to be a program for the provision of electric energy from renewable sources. It offered fiscal benefits and financing mechanisms and was geared towards long term contracting of electric generation. This program was implemented by CAMMESA in response to demand and by request from the former Secretaría de Gobierno de Energía de la Nación.

The program took place in the shape of open domestic and international calls for project presentation, known as Rondas. All the electric renewable energy acquired during the Rondas formed what was called collective purchases. The program could count on planning that articulated different levels of warranties, payments and sovereignty, all structured in the Fondo para el Desarrollo de Energías Renovables (FODER), created by the Law 27.191. These warranties, together with the Programa de Garantía with the World Bank, offered a larger level of security to the awarded projects [42].

The program had as main objective the installation of 1.000 MW in renewable sources (wind, solar photovoltaic, small hydroelectric uses, biogas and biomass).



However, results exceeded expectations and, during the three Rondas, it was possible to award more than 4.466 MW. In Ronda 1, 1.142 MW were awarded for an average price of 61.33 USD/MWh. In Ronda 2, 1.281 MW were awarded for an average price of 53.98 USD/MWh. In Ronda 3, 2.043 MW for the price of 51.48 USD/MWh [43].

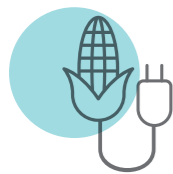
A fourth ronda of lower capacity (called MiniRen) took place between 2018 and 2019. In this ronda, forty-four projects in a total of 274 MW were awarded. This time, the purpose was to boost small-scale enterprises located throughout the country, with maximum capacity of 10 MW per project [42].

The business model employed was the Power Purchase Agreements (PPA), where the State, together with CAMMESA and FODER, sign Contratos de Abastecimiento de Energía Eléctrica de Fuente Renovable for twenty years. Those types of contracts receive a three-fold warranty mechanism: (i) a warranty per energy payment from FODER in case of delay or no payment for the energy delivered under the PPA; and (ii) two payment warranties for termination in the case of rescission or project sale and in which CAMMESA is not able to pay. The first warranty is obtained through Letras del Tesoro as guarantee. In the case of the second one, there is a warranty from the World Bank [42].

Once awarded, companies would start construction and/or remodeling of the power station. However, not all awarded projects finalized construction and many are under review (up to 2020).

Project status: latest Ronda RenoAr completed in 2019. There is no new ronda planned before the writing of this document.

5.1.2 PROBIOMASA PROJECT



The purpose of this project is to promote biomass-derived energy. It is an initiative from the Ministerio de Agricultura, Ganadería y Pesca through the Secretaría de Alimentos, Bioeconomía y Desarrollo Regional and the Ministerio de Economía through the Secretaría de Energía and with administrative and technical assistance from FAO [44].

The main objective is to increase biomass-derived production of electric and thermal energy at the local, provincial and national levels in order to assure a growing provision of clean, dependable and competitive energy and, at the same time, open new agroforestry opportunities, boost regional development and contribute to the mitigation of climate change [44].

Probiomasa offers (i) assessment of available biomass resources for energy generation, applying the Mapping of Integrated Biomass Supply and Demand in Energy methodology; (ii) support for public or private bioenergy projects in order to guarantee technical, economic, social and environmental sustainability; (iii) collective work with provincial and municipal teams for the adequate disposal of biomass residues and energy use; (iv) updated information which enable a better management of finance opportunities, of the current regulatory framework, of bidding and subsidies for public or private bioenergy projects; (v) support to research, development and demonstration of technologies for the use of biomass-derived energy; (vi) awareness raising and spreading of the benefits attained by the energy use deriving from biomass as consistent and renewable, having environmental protection in mind; and (vi) support to formative biomass-derived energy programs in progress at the national, provincial and municipal levels [44].

Project status: active and in progress.

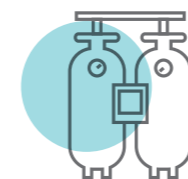


5.1.3 MERCADO A TÉRMINO DE ENERGÍA ELÉCTRICA DE FUENTES RENOVABLES (MATER)

This legal framework was regulated in August 2017. It sets the contracting mechanism among private parties as an alternative for the collective purchase through CAMMESA. MATER reaches the Great Users, who possess an annual average demand greater than 300 kW. Thus, they are able to elect their renewable electric energy provider and negotiate purchase conditions with this provider. Moreover, the Registro Nacional de Proyectos de Energías Renovables (RENPER) was created. Then, CAMMESA is in charge of prioritizing clearance [45].

The agency CAMMESA is responsible for prioritizing clearance for renewables generator under this regime. The individual who gains clearance priority over future transportation capacity, assumes the risk of no construction and/or habilitation of such capacity within the deadlines requested for the project development and will not have the right to complain together with the Estado Nacional, its decentralized entities, CAMMESA or any other public or private entity related to the construction project, due to delay and/or no construction and/or no habilitation of the planned transportation capacity.

Project status: active and in progress.



5.1.4 DISTRIBUTED GENERATION

The implementation of Law nr. 27.424 (approved by decree 986/2018) was concluded. Similarly, the complementary normative framework was finalized. It establishes conditions and measures for electric energy generation deriving from renewable sources for users of the distribution network on their own consumption and on eventual injection of exceeding energy into the network. The framework also establishes obligations for the distribution public service providers to facilitate such injection. It also establishes net metering for invoicing [46].

In order to promote distributed generation, some tools were devised: the Certificado de Crédito Fiscal (CCF) and the Fondo para la Generación Distribuida (FODIS). The CCF permits cancellation of domestic taxes (income tax or aggregated value). The FODIS operates as a mechanism for the application of financing tools for projects [47].

Each province should present its bill to be added to the normative. Up to September 2020, the provinces that had joined are: San Juan, Mendoza, Río Negro, Chaco, Corrientes, Córdoba, Ciudad Autónoma de Buenos Aires, Buenos Aires, Chubut y Tierra del Fuego [48].

Project status: active and in progress.



5.1.5 PERMER

Proyecto de Energías Renovables en Mercados Rurales (PERMER) began in the year 2000 and is presently active. Its main objective is to provide access to renewable sources energy to rural population, who not always have electricity because they live away from distribution networks. Hence, the project intends to improve the quality of life of rural inhabitants in Argentina.

Therefore, the project subsidizes provision and installation of photovoltaic systems and/or individual wind systems, mini networks, thermal solar systems, photovoltaic systems for the pumping of potable water and for productive processes [49].

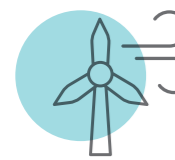
Project status: active and in progress.



5.1.6 PROPOSAL FOR THERMAL SOLAR ENERGY

The program geared towards thermal solar energy, Programa de Fomento a la Energía Solar Térmica, is under elaboration. Its purpose is to increase direct use of such energy through the creation of domestic hybrid thermal solar equipment. In numbers, this initiative would represent 525 direct employment places and an Argentinian production of approximately

30.000 pieces of equipment through an investment of 16 million in ARS. Moreover, it would mean diminishing annual consumption of natural gas in 5.7 million m³ [51].



5.1.7 PRODUCTION OF TECHNICAL CONTENT

Even though they were not considered programs or projects, there have been extensive production of technical material, radiation atlas and state of the art reports. Their impact to different renewable technology varied. The highlights were content related to thermal

solar energy, thermal solar systems, photovoltaic solar energy, geothermal state of the art technology, wind energy generation affecting flora and fauna, guides for distributed generation and procedures for the teaching of energy efficiency in Engineering and Architecture majors [50].



5.1.8 CURRENT STATE OF RENEWABLE ENERGIES PROJECTS IN ELECTRIC GENERATION

The current state of renewable energy projects can be seen in Figure 24 [51].

Figure 24: Summary of Renewable Energies in Argentina.



- 211 PROJECTS**
between operation and construction

- 5,723 MW**
9,846 MM USD of estimated investment
9,826 Direct jobs
6.2 Million Households Supplied

- 142 Projects under Commercial Operation**
3.125MW
Estimated investment: 5.921MM USD
Jobs: 2.400
- 69 Projects under Construction**
2.598MW
Estimated investment: 3,925MM USD
Jobs: 7,426
- LATEST INAUGURATIONS**
C.T. Venado Tuerto, de Andreas Keller, 2,1 MW, Venado Tuerto, Santa Fe
C.T. General Alvear de Cames de la Patagonia S.A., 1 MW, Gral. Alvear, Buenos Aires

Source: National Kick-Off Meeting for ICLEI 100% RE Project, 2020.

5.2 __ INITIATIVES RELATED TO ENERGY EFFICIENCY

Being in line with the objective of Law nr. 27.191, progressively increasing coverage for electric demand with renewable sources, energy efficiency allows for energy performance improvement in consumed energy. Hence, renewable generation can be increased by both the building of new power stations and the intelligent reduction of consumption.

The project called Proyecto de Eficiencia Energética en Argentina, which was financed by the European Union, was consolidated in 2018. It has been the executive arm for various already existing programs and projects along with new initiatives [52].



5.2.1 INDUSTRIAL SECTOR

Measures developed for the industrial sector by former Subsecretaría de Ahorro y Eficiencia Energética (part of former Secretaría de Gobierno de la Energía) are framed within the promotion of Sistema de Gestión de la Energía (SGEn), based on ISO 50001 norm [53].

This energy management standard focuses on the improvement of energy performance in organizations. Even not being exclusive to industries, this sector is the one that provided highest capitalization worldwide [54].

Collective resolution 1-E from 2017 offered subsidies over electric energy invoicing to priority electro intensive sectors in exchange for programmed delivery of reports based on required activities established by ISO 50001 norm. From those users, three are ultra-electro intensive. For them to have access to such subsidies, they would have to implement and certify ISO 50001 through an accredited agency.

The abovementioned resolution expired in 2019 and has not been renewed.

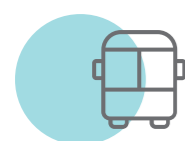
According to what was previously described and in trying to disseminate information among non-energy-intensive industries, the former Subsecretaría has devised two lines of action: financing of energy diagnostics (a key element for the implementation of an Energy Management System) and the ISO 50001 Project, which was a pilot project for promotion, implementation and certification in medium and large companies [55]. None of the two projects has been renewed since their expiration in 2018 because right after actions towards the development of Proyecto de Eficiencia Energética en Argentina started and its lines of action were similar to the ones in the previous project.

In 2018 the former Subsecretaría de Ahorro y Eficiencia Energética de la Nación together with the Gesellschaft für Internationale Zusammenarbeit (GIZ) from Germany developed the first Red de Aprendizaje en Gestión de la Energía, in Buenos Aires. Twelve companies were participants and the estimated savings as a direct result of the interventions in energy efficiency reached 14 GWh in electricity and 19GWh in natural gas [51] [56].

Starting in 2018, as part of promoting the SGEn, Argentina has adopted an equivalent version of the Premios en Excelencia en Gestión de la Energía (Energy Management Leadership Awards from the multi-state agency Clean Energy Ministerial), called Premio Argentina Eficiente. This award collects the punctuation obtained by Argentinian organizations in the original award. Up to November 2020, we had given away the award editions of 2018, 2019 and 2020 [57].

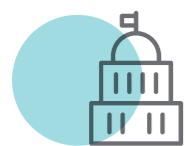
Finally, in the year 2019, a list called Listado de Consultores en Eficiencia Energética (list of consultants in energy efficiency) [58] was finalized. However, so far this list has not been required as a prerequisite for a line of action.

In August 2020, the Ministerio de Desarrollo Productivo released a series of programs called Programas de Acceso a la Competitividad with subsidies of up to \$200,000 for the implementation of energy diagnostics. The deadline for registration on the call for proposals was October 30 [59].



5.2.2 TRANSPORTATION SECTOR

In 2018, the first phase of the Programa de Transporte Inteligente (based on the program Smart Way in the United States) started and had the support from the former Ministerio de Hacienda and from the former Ministerio de Transporte. This initiative tried to connect cargo carriers, service and technology providers, universities and government units with the intent of having them adopt strategies, tools, technology and knowledge that could contribute to the improvement of efficiency in the use of fuel and, consequently, diminish contamination emissions during cargo auto-motor transportation [60]. The second phase started in 2019 but it was discontinued in December. In 2020, the Proyecto de Eficiencia Energética in Argentina released a Pilot Test for the Gestión Eficiente de la Flota de Transporte in Buenos Aires, Santa Fe and Río Negro [52].



5.2.3 PUBLIC SECTOR

The Programa de Uso Racional y Eficiente de la Energía en Edificios Públicos (PROUREE), from Secretaría de Energía tries to promote energy efficient management within the sector. Thus, it guides the public towards the reduction of consumption levels within buildings of Public Administration. The program suggests the following: (i) implementation of measures for the improvement of energy efficiency, (ii) introduction of criteria for energy management, and (iii) awareness raising among personnel about rational resource use [61]. In 2019, the former Subsecretaría de Energías Renovables y Eficiencia Energética developed a digital tool capable of performing a Preliminary Energy Diagnostics, geared towards energy administrators within public buildings [62]. All those tools were made available to provincial and municipal governments for the implementation of the Program in their respective jurisdictions.

Status: active and in progress with a total of 945 administrators, 1.159 assistants and 3.296 buildings [51].

Likewise, criteria for energy efficiency were included for any purchase made by the Estado Nacional through its site, which uses (<https://comprar.gob.ar/>) for energy consumption equipment. During the years of 2018 and 2019, there was extensive revision of agreements, frameworks, catalogs and reference forms that are used for the purchase of lamps, LED tubes, fluorescent tubes and appliances [63].

Status: active and in progress.

In 2017, the Plan Alumbrado Eficiente (PLAE) was created. The Plan is comprised of recommendations on the replacement of lights and lamps for more efficient LED technology equipment in the streets, both in Municipalities and in Provincial Roads within the country. That was put into practice through non-refundable money transfer [64]. This initiative was finalized in 2018.

By incorporating this kind of technology, the intent was: (i) to reduce energy consumption used on public streets lighting (in some instances this could represent up to 50% energy savings in comparison to present consumption) and (ii) to adapt public lighting levels of luminosity to the current norms [64].



5.2.4 RESIDENTIAL SECTOR

Here, initiatives are divided into two: (i) Programa Nacional de Etiquetado de Viviendas (labelling for homes) [65] and (ii) Etiquetado de Eficiencia Energética para equipos consumidores (labelling for appliances) [66].

5.2.4.1 PROGRAMA NACIONAL DE ETIQUETADO DE VIVIENDAS (LABELLING FOR HOMES):

The main objective of this program is to introduce the Etiqueta de Eficiencia Energética (energy efficiency label) as a tool to users about energy features in a home. As a result, this additional information should contribute to decision making when purchasing a home, assessing a new project or making interventions in existing homes [65]. Before its implementation, pilot tests were performed in different bio-climate zones within the country so information could be collected for the definition of ranges within the energy efficiency scale according to each zone. This initiative included the definition of standards for homes defined as social type.

Status: active and in progress. Figure 25 reflects the project status in August 2020.

5.2.4.2 ETIQUETADO DE EFICIENCIA ENERGÉTICA FOR PRODUCTS (LABELLING FOR PRODUCTS):

Decree-law nr 140/2007 originated this labelling program. It aims at requiring continuous development of norms regarding labelling and minimum standards on every product or machine that provides energy service through the use of energy of some sort or whose utilization impact energy consumption [51] [66].

In regards to products, we have: (i) mandatory labels with energy efficiency minimum standard (refrigerators, washing machines, air conditioners, halogen and fluorescent lamps); (ii) mandatory labels without minimum standard (induction motors, ballasts, TVs, gas stoves, gas cookers, LED lamps, electro pumps, dishwashers); and (iii) voluntary labels (electric stoves, fans, windows, photovoltaic solar modules, homes) [51].

Given its relative importance on the thermal comfort of homes, we also developed labels for carpentry products (external windows).

Finally, light vehicles (up to 3.500kg) also receive energy labelling as a tool for positioning its efficiency as a variable during the decision-making purchase process. The informative label refers to CO₂ emissions level. Such practice started in June 2019 and, in August 2020, 50% of all commercialized models came with it. The expectation is that, by December 2020, 100% of models will come with it [51] [67].

Similarly, in the year 2021, the comparative label in terms of the vehicle energy efficiency will be implemented. In October 2021, all models in the market will come with a label.

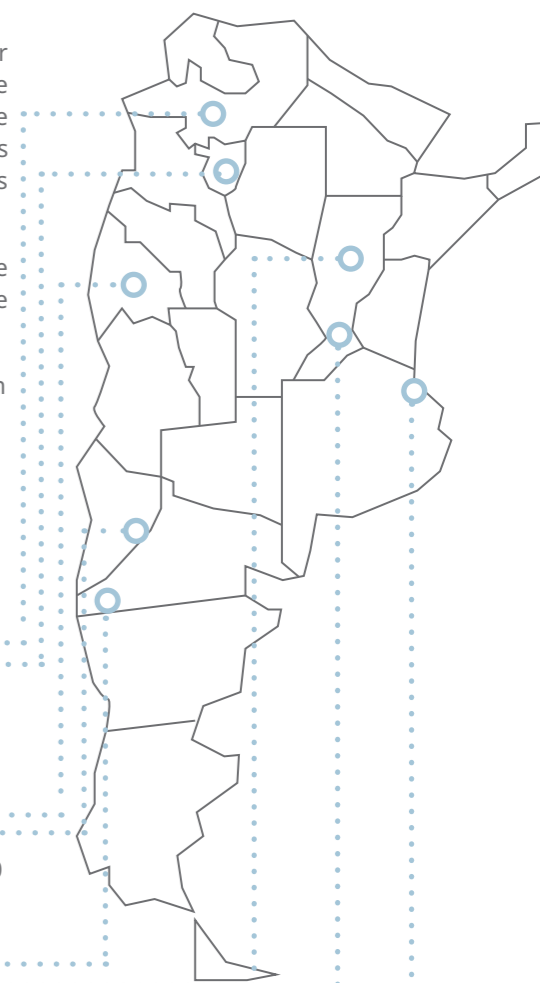
The agency in charge of publishing the respective norms and certification is the Instituto Argentino de Normalización y Certificación (IRAM).

Figure 25: Present state of Programa Nacional de Etiquetado de Viviendas.

SALTA 2019 60 Trained Professionals 209 Certified Houses	TUCUMÁN 2018 50 Trained Professionals 201 Certified Houses
MENDOZA 2018 50 Trained Professionals 200 Certified Houses	NEUQUÉN - CIPOLLETTI 2019-2020 80 Trained Professionals Demonstrative Pilot Project
RIO NEGRO - BARILOCHE 2018 60 Trained Professionals 201 Certified Houses	SANTA FE 2017- 2018 70 Trained Professionals 104 Certified Houses
CABA 2019-2020 110 Trained Professionals 150 Certified Houses	SANTA FE - ROSARIO 2017- 2018 275 Trained Professionals 107 Certified Houses

**15 TRAINING COURSES FOR CERTIFIERS
+750 TRAINED PROFESSIONALS
+1150 CERTIFIED HOUSES**

Source: National Kick-Off Meeting for ICLEI 100% RE project, 2020.





5.2.5 CONSTRUCTION OF PLAN NACIONAL DE EFICIENCIA ENERGÉTICA IN ARGENTINA

In May 2018, we received the Proyecto de Eficiencia Energética de la Unión Europea for the development of a proposal for the 3-year Plan Nacional de Eficiencia Energética, with funding in the amount of 4.3 million euros (this is a non-refundable contribution and with execution deadline of 36 months). This project focuses on the development of Energy Efficiency initiatives in various productive and non-productive sectors within domestic economy. It also aims at the spreading and socialization of the theme energy efficiency.

Its general objective is to receive support from the European Union in order to structure a more efficient energy sector in resource use. Its specific objectives are: (i) contribute to compliance towards the reduction proposed by the NDC; (ii) develop a proposal for a Plan Nacional de Eficiencia Energética; (iii) receive technical assistance for the development of pilot projects which demonstrate energy management in productive sectors like industrial, transportation, residential homes and private sector [68].

Lines of action presently under development are [51]:

- Training for trainers: home labelling.
- Structuring of five learning networks (Santa Fe, Tucumán, Córdoba, Pilar -province of Buenos Aires- and Misiones).
- Structuring of the first Learning Network in Energy Efficiency for the wine growing sector.
- Training for administrators: energy in public buildings.
- Efficiency in transportation: integrating logistics operators.
- Nacional Balance for Useful Energy² (Industrial and Residential).
- Structuring of diagnostics within industrial and transportation sectors.
- Home Certification.
- Public Building Certification.

An Implementing Consortium owns the project where four companies take part (two from Spain, one from Germany and Fundación Bariloche, the local counterpart).

The Proyecto de Eficiencia Energética contributed with Proyecto de Ley de Eficiencia Energética (indicated in la Table 10) with the intent of rising the institutionalization of energy efficiency at the national level. Such law will facilitate: (i) the creation of national goals for avoided energy by the year 2030; (ii) the institutionalization of energy efficiency at the national and local levels; (iii) the determination of sectoral obligations; (iv) the definition of measures and programs; and (v) the setting of incentive mechanisms for energy efficiency adoption.

In November 2019, Proyecto de Ley de Eficiencia Energética (expedition code S-3290/19) was presented and it has shown advances along the year 2020 [69].

2 - This is a study that enables a country and/or region to get to know what kind of activities use what kind of energy source, what for it is consumed (uses) and how it is consumed (in which kind of equipment and with which energy efficiency).



5.2.6 EDUCATION

Seminars, Formación para Equipos Técnicos Provinciales, for the training of interested parties are on the way. Agreements were set, Cooperación Académica con la Universidad Tecnológica Nacional, and alliances with Instituto Nacional de Educación Tecnológica and Instituto Nacional de Administración Pública became a reality [70].

5.3 QUALITATIVE IMPACTS

The Paris Agreement took place two days after the new government took office in December 10, 2015. It finished its mandate in December 9, 2019. The Agreement represented a turning point and Argentina uses it as a tool for changes and for initiative development.

Renewable energies and energy efficiency implemented measures (where the Agreement and the NDC are referenced) enabled the provision of regulatory and legal frameworks not only for the technical-economic feasibility but also as an instrument for diffusion and promotion.

In terms of energy per se, and in accordance with objectives proposed by Law nr. 27.191, those initiatives are made viable and concentrate on goals to cover renewable energies in a timely manner. Advances are reflected in Table 7, where we indicated increases in installed renewable capacity during the period 2015-2019. However, accelerated growth requires that infrastructure goes along in time and shape, especially in what refers to medium and high voltage cables within SADI.

Similarly, within the realm of renewable energies, we estimated that almost 11 thousand work positions were created, not only in human capital generated from training and qualification on the subjects but also from the building of factories of aero-generators, iron and concrete towers and trackers for photovoltaic parks [42]. All that also boosts the development of areas in market and in expertise geared towards science.

Other sets of initiatives contribute significantly for the compliance of goals related to Law nr. 27.191 in the sense that they reinforce energy consumption improvement in order to increase the percentages on renewables coverage. However, working on energy demand can present opposite characteristics to energy supply as the first is heterogeneous in nature, totally spread and with actors whose relative participation do not significantly modify consumed energy totals. That is why efforts are geared towards different fronts simultaneously, with work done over sectors of major consumption. For that matter, it is necessary to know where and for what energy is used. Enforced measures (projects and programs) look for determining uses for energy. In this sense, the start and consolidation of Proyecto de Eficiencia Energética manages to release pressure from public agencies so it is feasible to concentrate exclusively on technical matters. This way, the Secretaría is able to act as an authority for the application of respective procedures and the development of public nature measures. As a result, we expect to provide a proposal related to Plan Nacional, comprised of qualitative objectives and measurable and defined goals. Besides that, the Secretaría de Energía is the primary beneficiary of the Proyecto.

The labelling programs should receive special praise. On the one hand, it required collective effort from different actors in the market (Government, IRAM, business chambers and manufacturers). On the other hand, the programs constitute a tool for information diffusion and comparison among different models of equipment. This capability of assessing equipment service delivery having in mind energy criteria as well as assessing the purchase price tends to install in society a sense of savings. This idea is reflected in the creations of models A+, A++ and A+++, efficiency classes that did not exist at the time of the first edition of the respective labelling norm, which derive from Decree-law nr. 140/2007.

06 FINANCING PLANS

The purpose of this chapter is to describe the financing plan for energy in Argentina. The focus will be on the financing outline from which renewable energies have benefitted as of 2015. The chapter will also indicate the current state of things.

The following national laws mention funds related to renewable energies and energy efficiency:

6.1 __ FONDO DE ENERGÍAS RENOVABLES (FODER)

FODER works as a guarantee fund but not as a financing fund at present. It is a public, administrative and finance trust that works as an instrument for federal energy policy.

The building of this fund responded to the following mechanism: in face of compliance with Law nr. 27.191, MEM agents, whose average consumed capacity per year were larger than 300 kW in the calendar year previous to the transaction, could opt to retire from the conventional capacity purchase in order to cover a quota of 8% through renewable sources. The remaining agents (capacity lower than 300k) could not retire and, consequently, a specific charge was created and it is part of the electric energy tariff. Hence, this charge constitute FODER funds, which allowed the bidding Rondas RenovAr, among other initiatives. Other parts of the funds are contributions from Tesoro Nacional or they come from national accounts (as the account for Administración Nacional de la Seguridad Social - ANSES) [71] [72].

Figures 28 and 29 portray the mechanism in detail [72].

Status: the latest Ronda RenovAr happened in 2019; up to the final writing of this document there has been no scheduling for a next one.

6.2 __ FONDO FIDUCIARIO DE COMPENSACIÓN AMBIENTAL

In its article 34, it is stated that the fund is geared towards guaranteeing environmental quality, prevention and mitigation of negative or dangerous effects over the environment, environmental emergencies care; as well as protection, preservation, conservation or compensation of ecological systems and environment.

Officials are empowered to determine that such funds contribute to cover costs with restoration actions that could minimize any generated damage.

A special law will deal with integration, composition, administration and destination of such funds [73].

6.3 __ FONDO FIDUCIARIO PARA EL DESARROLLO DE LA GENERACIÓN DISTRIBUIDA (FODIS)

Disposition 62/2019 regulates this fund. It is geared towards the application of assets held in trust into the granting of loans, incentives, warranties, contribution of capital and acquisition of other finance tools, all of which are destined to the implementation of distributed generation systems derived from renewable sources [74].

Beneficiaries will be individuals who live in the Republic of Argentina and legal persons registered in the country, whose distributed generation projects had been approved by FODIS officials and which comply with rules established by the aforementioned law and its complementary norms (Law nr. 27.424, article 18) [74].

The fund was constituted to be a mechanism of facilitation in access to financing geared towards the development of projects in the area. Fiduciary is Banco de Inversión y Comercio Exterior (BICE) [74].

Likewise, the certificates, Certificados de Crédito Fiscal (CCF), were designed to foster projects based on distributed generation. This type of certificate is issued in the shape of a digital bonus in favor of the user and will be reflected in their AFIP account. It can be used for the payment of national taxes, like income taxes and aggregated value tax (IVA), among others, at the period of time the user chooses to, during the five following years after receipt [47].

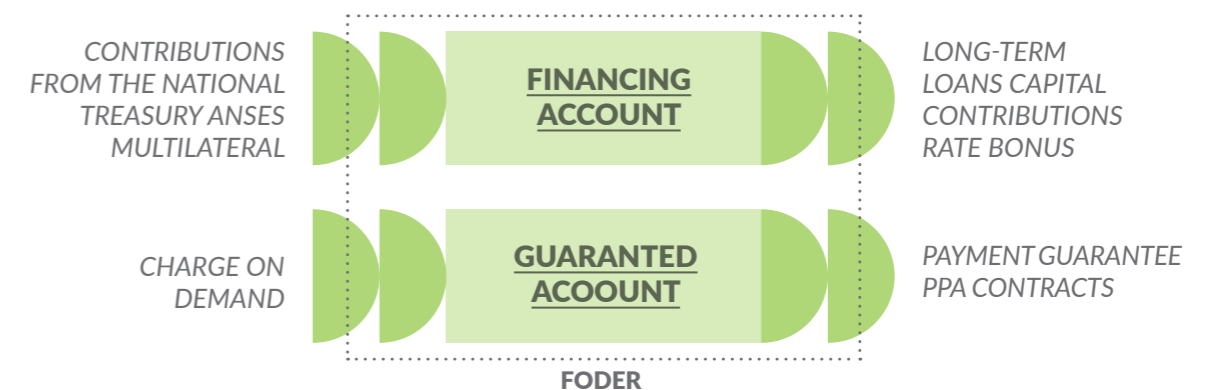
Status: work in progress on the development of tools for its implementation

6.4 __ CREDIT LINES

Another less specific possibility, if compared to the above mentioned mechanisms, is the access to funds or credit coming from a financial institution. The Banco de la Nación Argentina has a line of credit for Big Companies called, Proyectos de inversión destinados al uso de fuentes renovables de energía para la producción de energía eléctrica, designed specifically to companies who work with renewable sources and electric energy production. Thus, the Banco grants loans of up to 80% of the project total (up to a maximum amount of USD 6,000,000) through multiple disbursements for up to ten years [75].

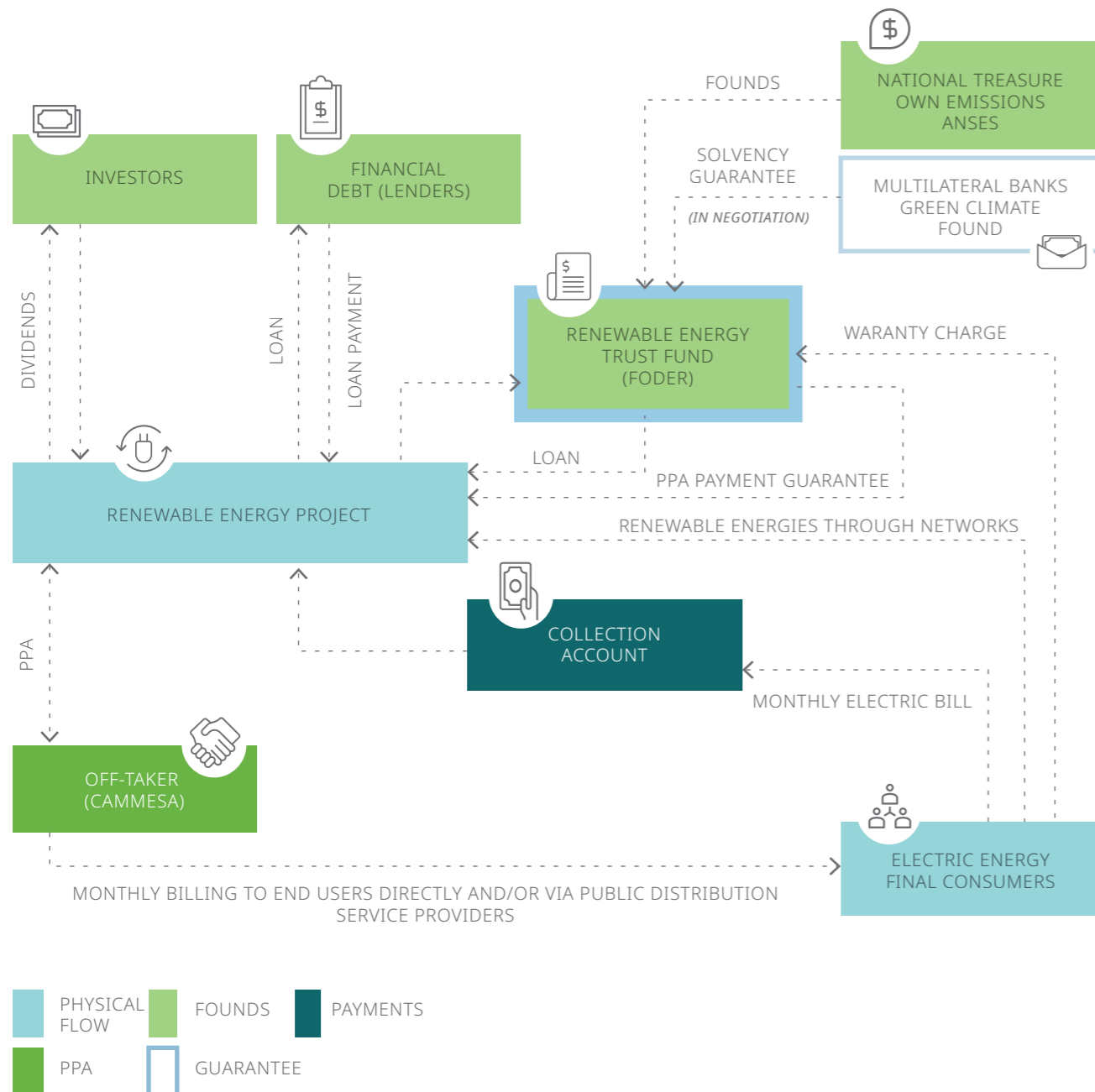
Status: active.

FIGURE 26: CONSTITUTION OF FODER ACCOUNTS



Source: Ministerio de Energía y Minería, 2016.

FIGURE 27: DIAGRAM FOR FUNDS INFLUX FROM THE PPAS PUBLIC BIDS.



Source: Ministerio de Energía y Minería, 2016.

07 MAPPING OF ACTORS

The purpose of this chapter is to identify and analyze relevant actors. This mapping of actors holds names of those who influence the implementation of the ICLEI - 100% Renewables Cities and Regions Roadmap project.

7.1 CRITERIA FOR SELECTION OF ACTORS

The procedures for the identification of actors involved in the ICLEI - 100% Renewables Cities and Regions Roadmap project will be done as described below.

First, the total universe of actors connected to the national energy scenario related to the realms of renewable energies and energy efficiency will be presented.

Then, there is the list that maps the actors for the 100%RE Project already identified through two-fold criteria:

- Level of incidence: key stakeholders are classified into primary stakeholders and secondary stakeholders.
- Jurisdiction/sector: actors are classified into six categories: government, civil society, academic institution, private sector, community representative or financial institution.

Key stakeholders are those who have a positive or negative effect over the project, based on reciprocity. Moreover, primary actors are those directly affected by the project, its actions and decisions, in a positive or negative way. Secondary actors are those indirectly affected by the project, its actions and decisions.

The objective here is to determine the actors who have the most influence over the implementation of the Project.

Such information is presented through a diagram called Mapping of Actors for the ICLEI - 100% Renewables Cities and Regions Roadmap Project.



7.2 IDENTIFICATION OF RELEVANT ACTORS CONNECTED TO RENEWABLE ENERGIES AND ENERGY EFFICIENCY

Below find the list of actors belonging to the energy scenario in Argentina and related to renewable energies and energy efficiency.

- ADEERA [Government]
- ADIGAS [Government]
- AGEERA [Government]
- Agencia Francesa de Desarrollo (AFD) [Financial institution]
- Asociación de Mujeres en Energías Sustentables [Civil association]
- ATEERA [Government]
- Banco de Inversión y Comercio Exterior (BICE) [Financial institution]
- Banco Centroamericano de Integración Económica [Financial institution]
- Banco Interamericano de Desarrollo (BID) [Financial institution]
- Cámara Argentina de Energías Renovables (CADER) [Private sector]
- CAMMESA [Government]
- Centro Argentino de Ingenieros (CAI) [Academic institution]
- Centro de Investigación en Economía y Planeamiento Energético de la Universidad Nacional de San Martín (CIEPE-UNSAM) [Academic institution]
- Centro de Transferencia Modal de Reconquista de UTN (CETRAM-UTN) [Academic institution]
- Comité Argentino del Consejo Mundial de Energía [Government]
- Consejo Federal de Energía Eléctrica [Government]
- Consejo Federal de Inversiones (CFI) [Financial institution]
- Cooperativa de Servicios Públicos de Avellaneda (COSEPAV) [Government]
- Corporación Andina de Fomento (CAF) [Financial institution]
- Dirección Nacional de Generación Eléctrica (DNGE) [Government]
- Empresa Provincial de la Energía de Santa Fe (EPESF) [Government]
- ENARGAS [Government]
- ENRE [Government]
- Fondo Financiero para el Desarrollo de los Países de la Cuenca del Plata (FONPLATA) [Financial institution]
- Fundación Ambiente y Recursos Naturales (FARN) [Civil association]
- Fundación EcoAndina [Civil association]
- Fundación Vida Silvestre [Civil association]
- GENNEIA [Private sector]
- Gobiernos Locales para la Sustentabilidad (ICLEI) [Civil association]
- Instituto Argentino de Normalización y Certificación (IRAM) [Government]
- Instituto Argentino del Petróleo y Gas [Civil association]
- Instituto Argentino para el Desarrollo Económico (IADE) [Civil society]
- Instituto de Estudios del Transporte de la Universidad Nacional de Rosario (IET-UNR) [Academic institution]
- Instituto Nacional de Tecnología Agropecuaria (INTA) [Academia and research]
- Instituto Nacional de Tecnología Industrial (INTI) [Academic institution]
- Instituto Tecnológico de Buenos Aires (ITBA) [Academic institution]
- International Climate Initiative (IKI) [Civil association]
- International Renewable Energy Agency (IRENA) [Civil association]
- Ministerio de Ambiente y Desarrollo Sostenible de la Nación [Government]
- Municipalidad de Avellaneda [Government]
- Municipalidad de La Plata (local government offices) [Government]
- Municipalidad de Rosario (local government offices) [Government]
- Observatorio de Energía y Sustentabilidad de la Universidad Tecnológica Nacional Facultad Regional Rosario (OES-UTN FRRo) [Academic institution]
- Proyección Electroluz SRL [Private sector]
- Red Argentina de Municipios frente al Cambio Climático (RAMCC) [Civil association]
- Secretaría de Energía de la Nación [Government]
- Sector de la banca argentina [Financial institution]
- Subsecretaría de Energía Eléctrica de la Nación [Government]
- SyESA Gas de Avellaneda [Government]
- Unión Agrícola de Avellaneda [Private sector]
- Universidades [Academic institution]
- Vicentín [Private sector]
- YPF Luz [Private sector]

7.3 MAPPING OF ACTORS FOR 100% RE PROJECT

Here is the finalized mapping of actors, based on the list of relevant actors related to the national energy scenario. Figure 28 shows the outline³:

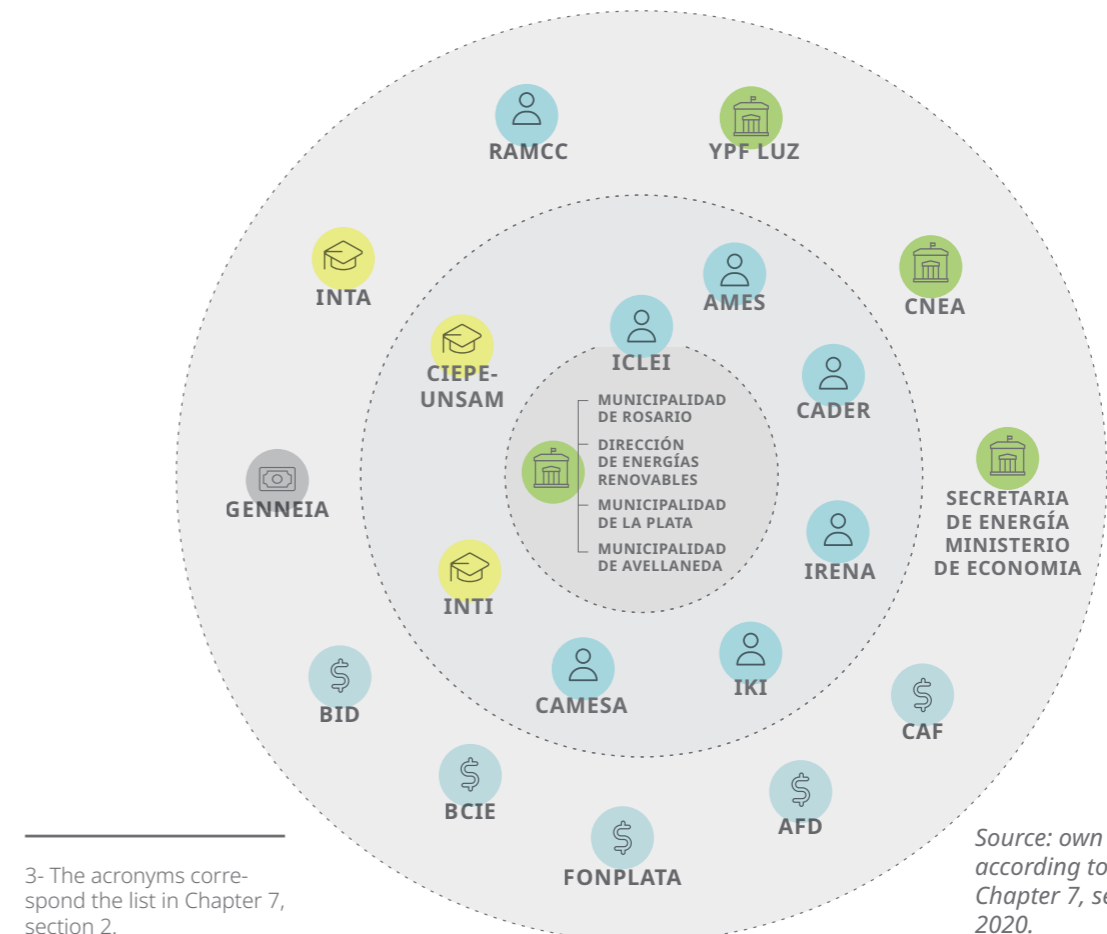
References are described in Table 11:

Table 11: References for the Mapping of Actors for the 100%RE Project.

NIVEL DE INCIDENCIA		JURISDICCIÓN/SECTOR	
	KEY STAKEHOLDER	GOVERNMENT	CIVIL SOCIETY
	PRIMARY STAKEHOLDER	ACADEMIC INSTITUTION	FINANCIAL INSTITUTION
	SECONDARY STAKEHOLDER	COMMUNITY REPRESENTATIVE	PRIVATE SECTOR

Source: own creation according to the list in Chapter 7, section 2, 2020.

Figure 28: Mapping of actors for the 100%RE Project



3- The acronyms correspond the list in Chapter 7, section 2.

Source: own creation according to the list in Chapter 7, section 2, 2020.

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- Resolution: former Secretaría de Energía 108/2011
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- Resolution: AFIP 4511/2019
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