



CAETS 2020 Energy Report

Country Analysis Questionnaire

Working Title: *Solutions for High-level Penetration of Intermittent Renewable Energy*

Overview

The focus of this paper is how countries worldwide are each making the energy transition towards clean energy systems, whilst dealing with the inevitable problems of energy intermittency. This paper will attempt to address **two** suggestions to an audience of political authority looking for expert advisory: first, addressing how renewable **stabilizing technologies** are being implemented en masse, and second, discussing market-based **policy regulations** that attempt to mitigate problems caused by intermittency.

Please fill out the questionnaire by **September 15th, 2019**, regarding to your country's situation and your academy's view. Altogether, please limit your response to less than **5 pages**, and give short 2-3 sentence answers or bullet points. If possible, use charts, tables, references and other data measures.

Remember this data is to be juxtaposed against other countries policies. Pick and expand upon issue areas that are widely relevant, and not just niche markets. If applicable, you may indicate where scientific evidence or assessments by your academy differ from the official national policy. Also, clearly demarcate instances of where you think your country deviates from most other countries.

Target Audience

1. Members of international academies
2. International bodies such as United Nations SDG, Mission Innovation, etc.
3. Written for political advisory & policymakers

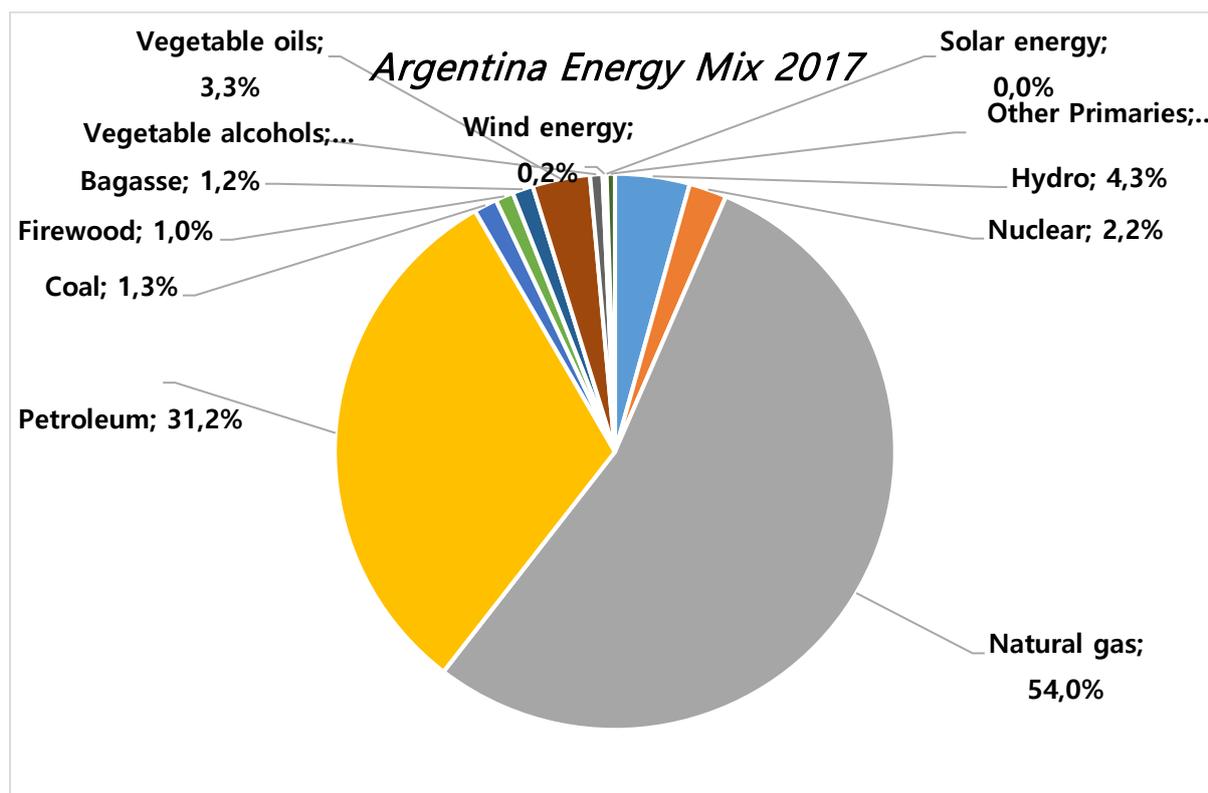
I. Introduction

i. Energy Status Quo

a. What is the current national energy portfolio, as of 2018*? Please include any data graphics describing the energy mix in your country, along with data in this table format (below):

*Please include a separate table with current 2019 figures if available. If neither have not yet been compiled, please use 2017 metrics.

National Energy Balance 2017



2018* Data	Amount/Rate
Power generation amount (GWh)	137,825 Gwh
Power generation ratio (% of total generation)	2.4%
Top 3 renewable energy sources	<ul style="list-style-type: none"> ■ Wind Mini Hydro, Biomass - Conventional Hydraulics have 25% to 30% of the country's total Power generation - Wind and Solar have today only 2.4%, but with high use factor:> 50% and> 35% in the areas of higher performance.
Growth rate of total renewable generation (% per year) over the past five years	2018 vs 2017: 27.1% 2017 vs 2016: 0.1% 2016 vs 2015: 6.6% 2015 vs 2014: 7.2% 2014 vs 2013: 16.3%

b. Looking ahead to 2040 (or 2050),

1. What are future goals (national for renewable growth rates)?

There is an explicit Government goal of the to achieve 20% of Renewable Energies (Excluding big Hydroelectric Plants) by 2025.

▪ There are mandatory legal targets per year of Renewable Power generation ratio:

2019: **12%**

2021:**16%**

2023: **18%**

2025: **20%**

2. Using the same metrics as asked in Q1a, what is the trajectory or national strategy for these energy policy in your current administration? (include table)

Since 2016 there is a strong increase in the number of projects under construction, reflected in 2018/2017 growth of 27.1%

A. What are the target milestone years?

2019, 2021,2023 and 2025

As we have mentioned, until the year 2025 there are quantitative goals established by the National Government.

During the years 2018 and 2019, approximately 25 of the largest Argentine Civil Society Institutions, (including Argentina National Engineering Academy), working as a team with the Ministry of Energy, have developed a set of Objectives and Goals to be met until the year 2050. There are two goals related to this question that will be presented in a month to the authorities: This is in Process. The proposed goals are:

- 1). By 2050, electricity generation will contribute their share of Argentina commitments regarding CO2 emissions and temperature increase.
- 2). By 2050, increases in energy efficiency will have allowed the current level of "Energy Intensity" to be reduced to less than 50%.

B. What are the benchmarks of progress for improvement metrics?

▪ There are no specific partial goals except those mentioned above and 20% for 2025 established by the Government.

iii.- Problems in Intermittency

a.- How severe is the problem of electric isolation, electric 'islands' or isolated grids?

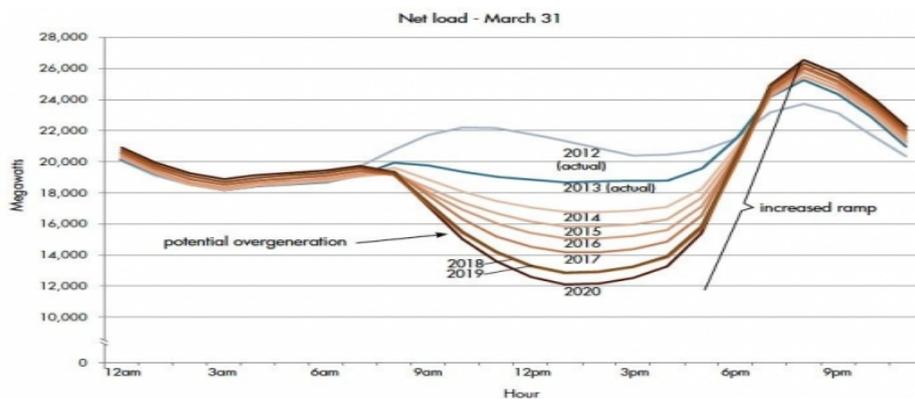
There is reduced productivity in the system due to the very low Load Density and the great extension of the country. The quality of service is poor. There is no doubt that these isolated areas should be a priority objective for the Distributed Generation with storage.

b.- Is your country experiencing a Duck Curve phenomenon? (ex. Denmark)

This phenomenon is not visible with only 2.4% of Renewable Generation. (Solar Energy is of course an even smaller percentage). On the other hand, in the Argentine Central dispatch that handles power generation plants, the last machines dispatched are the accumulation hydroelectric plants, which would make it possible to neutralize the phenomenon of the "Duke Curve" up to quite high percentages of participation of Solar Energy.

1.- If yes, discuss well-known or severe case studies and include a duck curve chart that captures generation data from over the past 5-10 years (example below). If no, please discuss effective grid management techniques (or others) that prevented this:

The use of Hydroelectric Power generated by large Dams, solve this problem with up to 20% of renewable energy.



- 2.- What are some steps that have been taken to mitigate this phenomenon?
- None.

3.- In efforts to mitigate, is the power system of your country interconnected to the system of another large body, such as another country or international system to increase control of supply-demand?

During the last 20 years, the interconnection with Brazil has allowed to solve many situations of shortages not foreseeable in both countries. Brazil has an Energy Matrix based on the Hydroelectric Generation and Argentina on Thermal Generation. On a smaller scale, the interconnection with Uruguay has shown the same advantages.

4.- What steps are being taken to correct the level of energy isolation to bring it to greater efficiency?

In the last 40 years, despite the low energy density of Argentina, several "Rural Electrification" Programs have been launched with credit support from Multilateral Organizations. Currently, the option of Solar Distributed Generation with Storage is being analyzed by companies that offer this alternative to agricultural producers.

II.- The Solution Part 1: Technologies That Streamline Implementation

a.- What are some typical or latest technologies that attempt to mitigate problems of intermittency that your country is making strides in?

The largest electricity company in Argentina, is installing smart meters for a pilot experience. After having completed this Pilot experience, it will begin to bring its technologies and systems to Argentina to improve the quality of service and increase the productivity of the network through intelligent software.

b.- What is the primary storage system that being used or is being developed?

Water storage is the main source. Seasonal water accumulation in dams in Argentina (and therefore of energy storage). In recent years, it has been verified that the joint dispatch of hydroelectric dams and wind power plants allows a greater joint use factor. and also makes it possible to convert Wind power into "Firm or Non-interruptible Energy". This combination with (Hydro + Wind and / or + Solar) increases the capital productivity of the set of the two technologies.

c.- Are there attempts to actively phase out old technologies? If yes, please describe the national strategy motivating this transition. If no, briefly discuss how this will affect the energy transition in the context of promoting clean energy.

- In the 90s Argentina placed 12 combined cycles in 7 years. The operation of Low Efficiency Turbo Steam Power Plants was practically paralyzed. In the year 2002, the thermal generation of Argentina (70% of the Total Generation) showed the highest thermal efficiency in an international comparison. An annual average of only 1630 Kcal / Kwh was recorded.

- The next 30 years will show in Argentina a growing evolution of gas production. This will be used internally to reduce emissions in Power Generation and export LNG to contribute to replace carbon in other countries of the world.

d.- In the following subject areas, please pick and discuss whether this category of technology is relevant to your country. If not applicable, please indicate (1-2 sentences) the status of this technology as whether or not it is being pursued at this time

i. What technology is under development (or implementation) that attempts to stabilize normal grid operations?

- Operation and dispatch joint Hydro - Solar or Hydro - Wind

ii. What technology is under development that attempts to implement smart meters and demand-side management?

- Argentina is doing pilot experiences.

iii. What technology is under development that attempts to make more energy-efficient in heating/cooling mechanisms for residential homes?

. The construction industry uses insulation materials that avoid losses of heat or cold.

iv.- Any other new smart tech in development? Examples include, but not limited to, block chain, risk management, anti-cyber threat security, etc.

. None

4. The Solution Part 2: *Market-Regulating Policies that Promote Seamless Energy Systems*

a.- How is your country approaching new electricity pricing mechanisms?

Argentina's regulatory framework, originated in the '90s using Short Term Marginal Costs to form prices in the wholesale market (STMC, for its acronym in English) is currently under review and the Government has already called an international tender to define a new modern regulatory framework that will include renewable energy operations.

The preparation of this new framework is being tendered at this moment in Argentina. It is requested that the bidders be headed by an international Consultant with experience in the subject.

b.- Is there a system of carbon emissions trading in act? To what fund does revenue from this program go towards?

▪ No

c.- What are new distribution infrastructure investments that your country is currently spending?

For the current 25,000 Mw of demand, investments in Distribution reach approximately 700 to 800 Million US \$ per year. (If the Distribution concept includes Transmission Expansions in High Voltage the figure will be increased by the strong introduction of renewables, usually far from the Demand).

d.- How has the public opinion towards the energy transition been in the past? How is the current administration or local municipalities approaching campaigns to affect public opinion on renewable energy systems?

In general, public opinion is favorable to the decarbonization of the environment. The advertising campaigns of private companies and the State also contributed in this regard.

5. Suggestions

a. What suggestions do you have to offer in deciding the future of intermittent energy in your respective country?

- Main Points can be summarized in 3 items:

1.- Government must regulate the indispensable: as an example, goals of reduction of emissions fixing milestones every 5 or 10 years (2030, 2040, 2040). Annual reviews should be done.

2.- The proposed agreements between the Private Sector and the Government that were most mentioned at the WEC World Energy Congress in Montreal in 2010 should be established: **Among them, regarding the Energy Matrix, the winning technologies must be selected by the Market".** (The Regulator should set the acceptable percentage of emissions every year)