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THE ROLE OF SMALL MODULAR REACTORS IN  
THE ENERGY TRANSITION

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# 1. General framework – LATAM



1. Two nuclear power plants with three reactors: Atucha and Embalse.
2. In 2024, the “CAREM 25 prototype SMR” will be finished.
3. 5.4% of its power matrix is produced by nuclear energy (1641 Mw in operation and 25 under construction).
4. Has the National Nuclear Activity Law – Law 24805 of 1997 and its Decree 1390.
5. Two nuclear authorities: National Atomic Energy Commission and Nuclear Regulatory Authority.



1. Mexico has two operating nuclear reactors located on the east coast of the country.
2. 4.5% of its power matrix is produced by nuclear energy.
3. Mexico has a nuclear Law amended in 2012.
4. Mexico has the National Nuclear Safety and Safeguards Commission as a specialized authority.

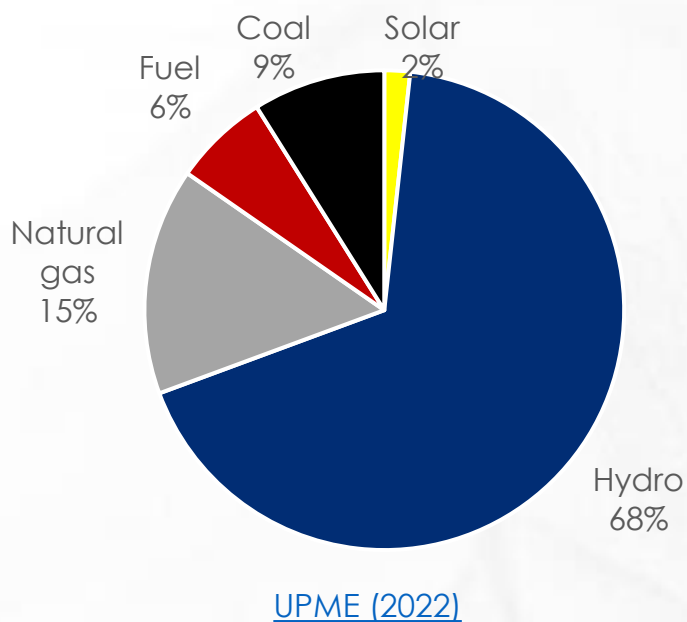


1. Chile has two nuclear research reactors of 5MW. However, none of them are used for power generation.
2. Chile has the Chilean Nuclear Energy Commission as a specialized authority.
3. Law 18302 of 1984 - Nuclear Safety Law.



1. Ecuador has no nuclear power production.
2. Ministry of Mines and Energy has an Under-Secretariat for Nuclear Control and Applications. They also have the Ecuadorian Atomic Energy Commission as a specialized authority.
3. Ecuador has the Law of the Ecuadorian Atomic Energy Commission published on 23 March 1979 and its amendments.

## 2. Could SMRs be developed in Colombia?



- The primacy of hydroelectric generation allows the energy matrix to be mostly sourced from clean energies.
- However, when natural phenomena such as El Niño Southern Oscillation occur, it's necessary that other energy sources provide back-up to the system.
- The only primary energy sources that provide reliability to the system come from fuel, coal, and natural gas.
- Colombia is promoting the inclusion of new solar and wind generation assets.
- However, these sources are subject to climate conditions beyond the control of project sponsors. Thus, storage systems are expensive and the implementation of the first project in Colombia is at risk as per announced by the Ministry of Mines and Energy.
- Nuclear energy is an alternative that could provide reliability to the system as it is not subject to climatic variables. Likewise, it would be a clean alternative since it generates 12 grams of CO<sub>2</sub> per kWh, compared to the 24 grams produced by hydraulic energy and the 41 grams from solar energy.

### ¿How to implement SMR in Colombia?

1. A study published by ENERLAC in December 2023 shows that the areas with potential for the installation of SMRs in Colombia are located in Antioquia and Meta. These areas meet all the criteria established by the International Atomic Energy Agency regarding health, safety, physical protection, social, economic, environmental, and engineering aspects.
2. The regulatory framework for the inclusion of nuclear energy in the Colombian energy system must be developed. Mechanisms to promote investments should be devised as well.
3. According to GenCost, the cost of nuclear energy per kWh may be more than twice than that of the solar and wind energy. Therefore, mechanisms should be developed to ensure efficient remuneration for investors - ¿Reliability Charge? ¿Special PPA auctions?

# 3. Current regulatory framework

- ✓ Nuclear is recognized as a non-conventional source of renewable energy in Law 1715 of 2014. Therefore, investments for research and production of these sources can be subject to tax benefits.
- ✓ Connections to the system are regulated by Resolution CREG 075 of 2021, applicable to all technologies. Thus, it is possible that these same rules could be used for nuclear power generation.
- ✓ Decree 0381 of 2012 established that the Ministry of Mines and Energy shall adopt the national policy on nuclear and radioactive materials. However, this ministry has not created such a policy.
- ✓ Colombia has some regulation related to radioactive waste disposal, transport and use of radioactive materials. By Resolution 18-1475 of 2004, the Ministry of Mines and Energy established the regulations for nuclear installations. However, is too general and should be updated for the inclusion of SMR.
- ✓ It will be important to set out rules for the participation of these plants in the Central Dispatch. Resolution CREG 024 of 1995, 055 of 1994 and its amendments establish the provisions for calculating the costs of the plants depending on their technology. Therefore, it will be necessary to consider introducing special rules in this regard.
- ✓ The main mechanisms to trade energy in Colombia are the spot market and PPAs market. However, given the high price of kWh produced with nuclear energy, it is likely that this technology will not be able to participate competitively in such schemes.
- ✓ Nuclear energy plants may participate in the Reliability Charge mechanism under the current regulation. However, is important to stablish a mechanism to promote the investment in these plants, such as the PPA auctions implemented to promote solar and wind power plants.



# 4. Status in Colombia – Preliminary steps

**1** CONPES 4075 of 2022

This document sets out the strategies and public policy steps for the energy transition. The document acknowledges that Colombia does not have an energy policy to develop and promote the nuclear power production.

**2** National Energy Plan 2022 - 2052

It is a long-term planning that proposes different pathways and technological alternatives for energy production and consumption. It expects the incorporation of 900 MW distributed in three units of 300 MW SMR that should be operational by 2038. Provides for a term of 15 years for the government to regulate this type of projects. It acknowledges that the nuclear capacity will act as a firm source of energy, strengthening the electricity system and complementing conventional thermic generation. This will reduce dependence on thermic generation without neglecting the security of the system.

**3** Law Draft

It is expected that in the first half of 2024, a draft law establishing a clear institutional framework for nuclear energy will be submitted to Congress. The draft law not only envisages the production of nuclear energy for power generation, but also for medical use.

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