Ensuring Reliability and Resilience in South American Power Markets

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Motivations

- The global electricity sector is undergoing a period of rapid change as power systems move towards decarbonization, digitalization, and decentralization.

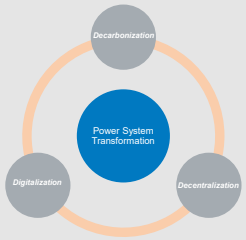

Fig. 1. Key drivers of global power system transformation.

- This transformation has significantly changed the way power systems are designed, planned, and operated.
- Power system flexibility has been receiving increasing attention as variable renewable energy (VRE) and demand-side technologies are widely adopted.

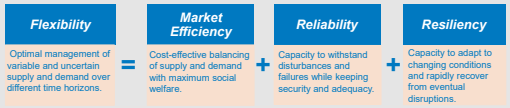

Fig. 2. Components of power system flexibility.

- Select countries in South America that rely heavily on hydropower are facing increasing risk and reliability concerns during drought (El Niño/La Niña) years.
- VRE and natural gas (NG) are becoming important generation options in many South American power markets, especially in drought years.
- There is an increasing need to expand emphasis on flexibility due to reliance on hydropower and VRE supplies.

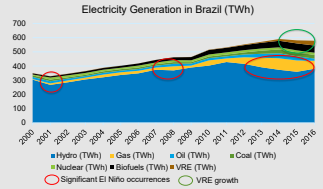

Fig. 3. El Niño events and VRE growth in Brazil. Source: IEA (2018).

Methodology

- **Primary countries of focus:**
  - Argentina
  - Brazil
  - Chile
  - Colombia

Fig. 4. Primary countries of focus.

- **Key tasks:**
  - Understand how the generation mix in key countries varies depending on hydropower resources.
  - Study how VRE can be used to minimize overall costs when hydropower is plentiful and how NG can complement hydropower and VRE.
  - Identify opportunities, challenges, and needs for domestic NG and VRE production options in South America.
  - Examine new market designs to keep NG plants profitable during years of plentiful hydropower.
  - Evaluate the potential for more LNG exports to the region.

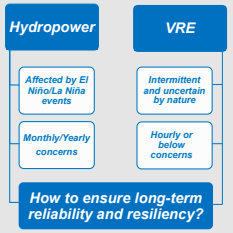

Fig. 5. Main issues of hydropower and VRE.

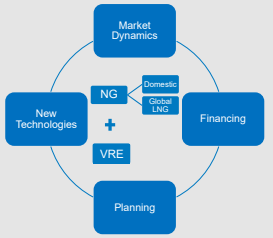

Fig. 6. Main areas of focus.

Preliminary Work

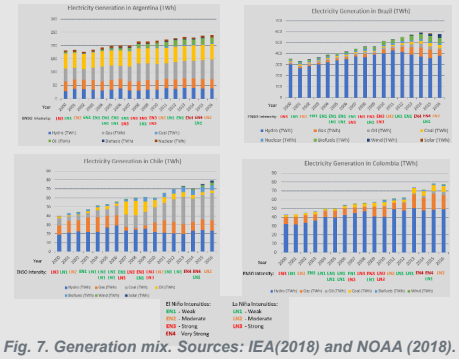

Fig. 7. Generation mix. Sources: IEA(2018) and NOAA (2018).

Table I. Most significant events and complementarity sources

Country	Most significant event	Complementarity sources
Argentina	La Niña	NG and oil
Brazil	El Niño	NG, oil, coal, and VRE
Chile	La Niña	NG, coal, and VRE
Colombia	El Niño	NG

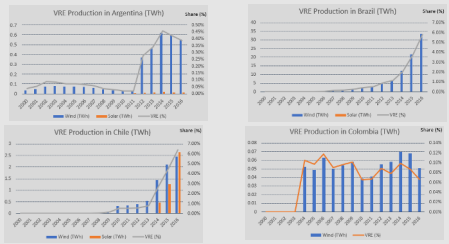

Fig. 8. VRE production. Source: IEA (2018).

- South America is well endowed with NG resources. However, the lack of investments in exploration and production has prevented larger domestic production.
- The continent is a net oil and coal exporter but has been a net NG importer since 2008.

Table II. NG in 2017. Source: CIA (undated).

Country	NG Proved Reserves (Bcm)	NG Production (Bcm)	NG Consumption (Bcm)
Argentina	336.6	40.9	49.0
Brazil	377.4	24.0	34.3
Chile	98.0	1.2	5.1
Colombia	113.9	10.0	10.1

- LNG imports have become a source of flexible supply to meet peak demand during dry seasons.

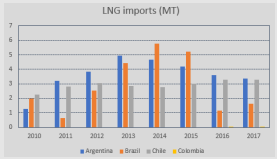

Fig. 9. LNG imports. Source: GIIGNL (2018).

- The Global LNG market is evolving rapidly and moving towards higher liquidity, flexibility, and commoditization.
- LNG market trends include “gas-on-gas” prices, short-term, lower-volume, and destination-free contracts, and increasing integration of portfolio players.
- New technologies are enabling cost-effective and fast delivery of LNG storage and regasification. Floating Storage Regasification Units (FSRUs) are more affordable than onshore terminals and enable LNG importers to enter the market faster.
- LNG imports under emerging business models and contracts may help key South American countries to ensure long-term reliability and resiliency.

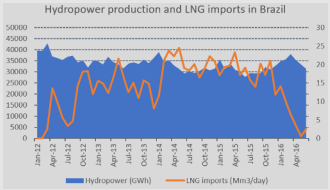

Fig. 10. Hydropower and LNG in Brazil. Source: MME (undated).

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