

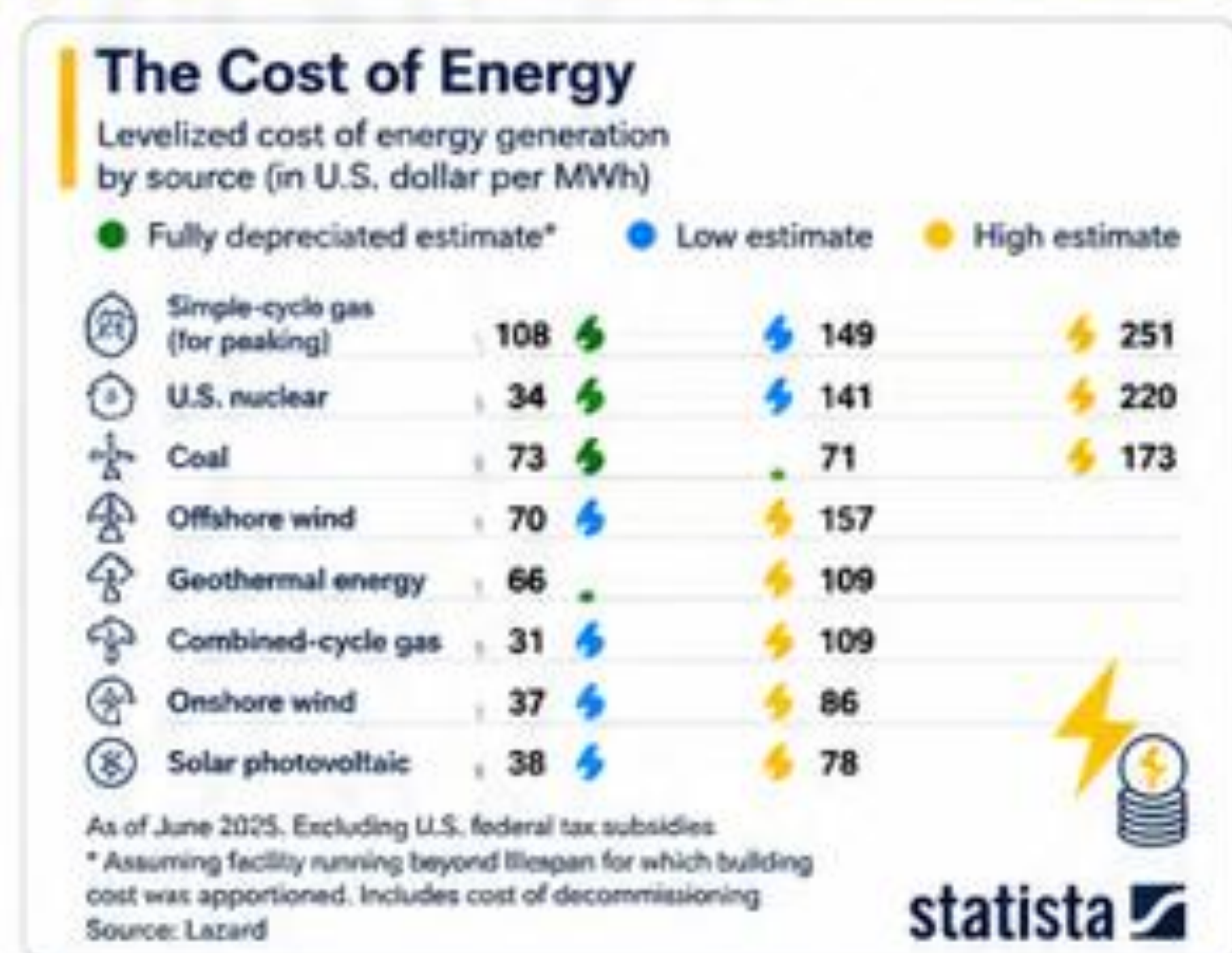
# Optimizing energy planning in countries with extreme climates: a methodological proposal for the Colombian case

César Castro, Lina Montuori, Manuel Alcázar-Ortega

Institute for Energy Engineering, Universitat Politècnica de València, Camino de Vera s/n, 46022 Valencia, Spain

## INTRODUCTION

- Hydroelectric systems are vulnerable to:
  - Droughts.
  - Climate variability increases electricity price volatility.
  - Energy diversification improves resilience.
  - Hydrogen may support renewable integration and storage

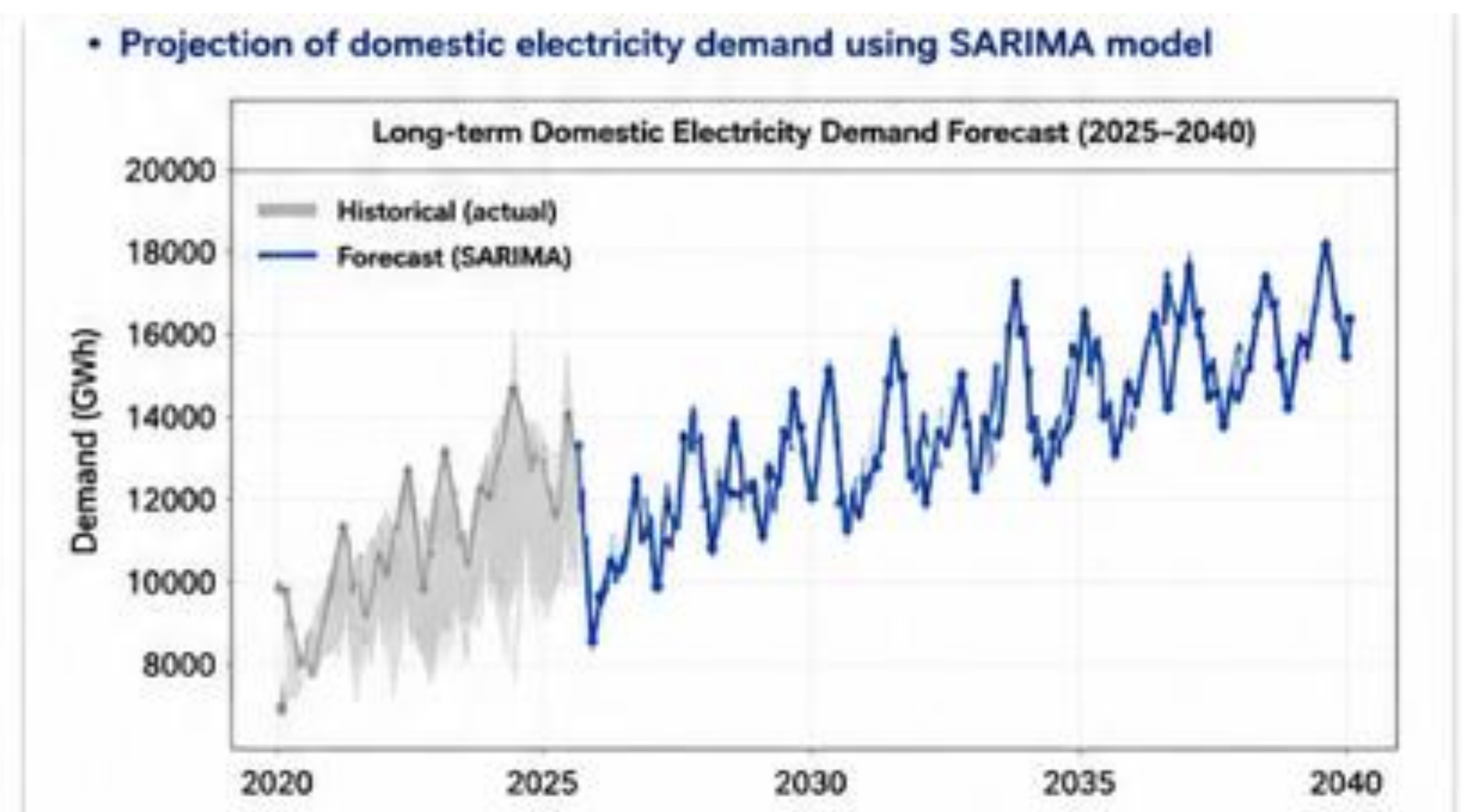
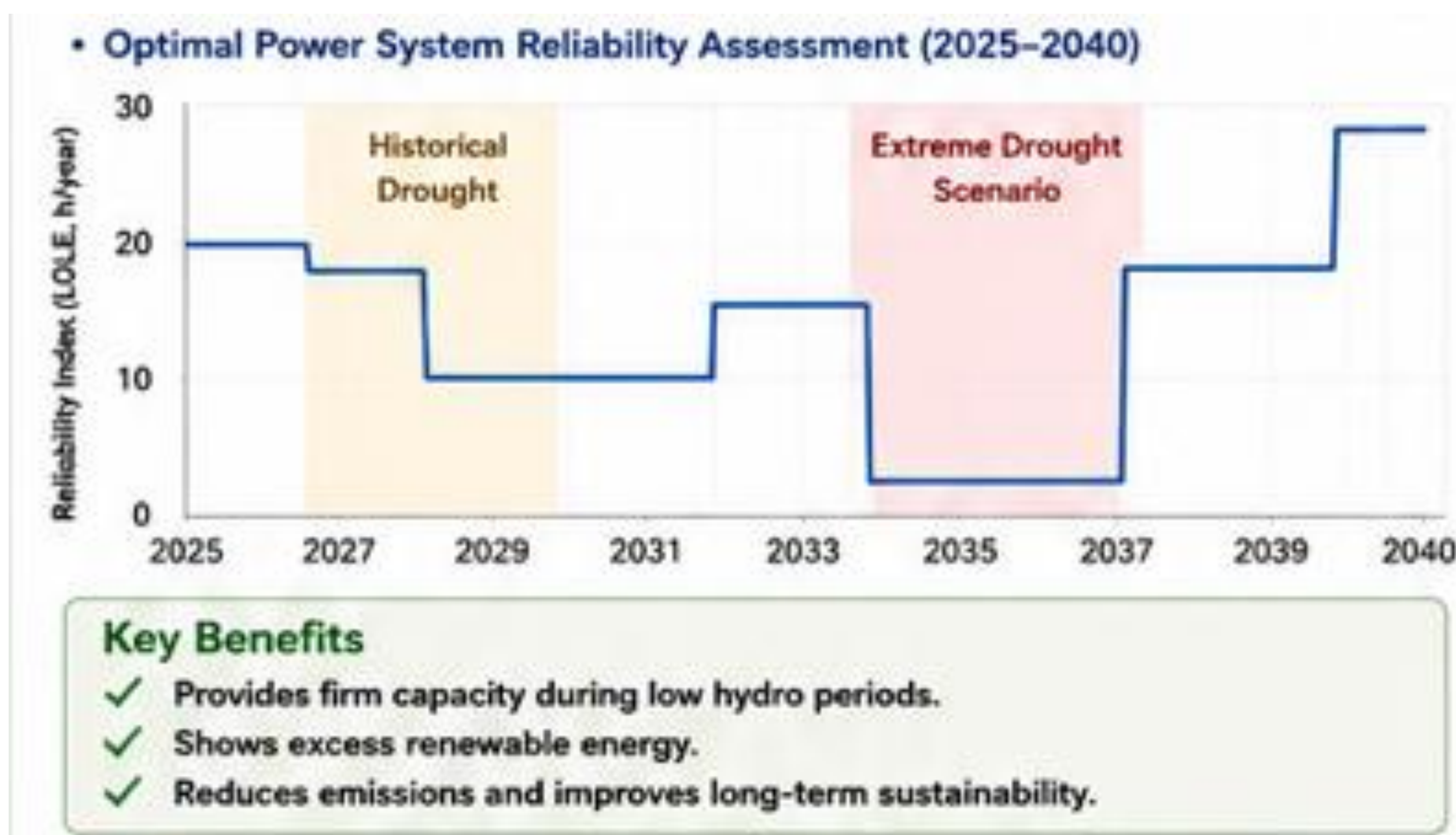


## METHOD

The proposal framework integrates five key components for medium-term energy planning.



## RESULTS & DISCUSSION



## CONCLUSIONS



A diversified energy matrix, supported by hydrogen and renewable technologies, along with price stabilization mechanisms and regional cooperation, can reduce exposure to climate risks and electricity price volatility. The proposed framework provides a structured approach for medium-term energy planning, enhancing energy security, affordability, and system resilience.

## FUTURE WORK

- Accelerate renewable energy integration through the expansion of solar and wind capacity and access to new electricity markets.
- Support hydrogen development through hydrogen research, strategic pilots, and value chain strengthening.
- Improve energy flexibility and storage: implement demand-response strategies and energy storage systems to reduce price volatility.
- Incorporate climate uncertainty into planning: include drought scenarios and climate variability in medium-term energy planning models.