ELECTRIC SYSTEM EXPANSION SELECTION PROCESS IN ARGENTINA

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Overview

This work initiates a crucial discussion on the Decision-Making Mechanisms for the Expansion of the Argentine Electrical System. A proposed mechanism aims to reduce uncertainty, enhance institutional transparency, and provide a standardized, economically justified approach to decision-making, focusing on factors like capital costs, operational considerations, and potential future externalities such as emissions taxes. In the context of a global energy transition, this work underscores the importance of addressing energy security and climate change, emphasizing the role of electrification in reducing carbon emissions and contributing to broader environmental goals. This work examines Argentina's current decision-making methodology for electrical expansions, evaluating its impacts and appropriateness within the outlined context. Additionally, a review of existing technical tools is undertaken, assessing their suitability for the planning objectives. This work concludes with a recommended decision-making mechanism and tool tailored to Argentina's needs. It highlights the opportunity for the country to demonstrate regional leadership in addressing the climate crisis.

Methods

The methodology employed in this work involves a literature review of the decision-making processes in Argentina, Chile, Brazil, Great Britain, France, Mexico, and Norway. This comprehensive analysis explores the methodologies used in each country's electrical system expansions. The research includes a comparative examination of the roles played by various stakeholders in these mechanisms, aiming to identify patterns and best practices. A list of attributes was defined to structure the comparative analysis, serving as a systematic framework for evaluating and contrasting the unique features of each decision-making process across the selected countries.

This study's analysis of technical tools employed a comprehensive literature review to explore existing research and documentation related to the identified technical tools. Case studies were examined to provide real-world context and insights into the practical implementation of these tools. Detailed descriptions of each tool's capabilities were analyzed to elucidate their key features, functionalities, and potential contributions to electrical system expansion decision-making. A systematic comparison was undertaken, organizing the technical tools into a taxonomy to facilitate a structured evaluation based on defined criteria. This systematic approach allowed for an analysis considering the theoretical aspects and practical implications of the technical tools under investigation.

Results

The proposed decision-making method for electrical system expansions in Argentina, drawn from a review of practices in Brazil, Chile, France, Great Britain, Mexico, and Norway, involves an annual analysis of long-term Energy Scenarios by the Secretariat of Energy, covering a minimum of 30 years. This serves as the foundation for an exclusive yearly Long-Term Expansion Plan, collaboratively authored by the Regulator (ENRE), the Secretariat of Energy, and the Operator (CAMMESA), focusing on indicative transmission and generation expansions over a decade. A Panel of Experts resolves disputes. Transmission expansions in the plan undergo preliminary studies and high-level Environmental Impact Assessments commissioned by third parties. The plan's results are the input for a Short-Term Plan for transmission expansions over the next five years. This short-term plan excludes political influence, with the Regulator in charge and in collaboration with the Operator. Generation needs are identified, and differentiated tenders are issued in coordination between generation and transmission. Adjudication involves a Panel of Experts, with stakeholder participation through Public Hearings. Short-term plan decisions trigger detailed studies, and the relevant transporter supervises adjudicated projects.

In the process of selecting a technical tool, a comparison of attributes is conducted. The tools, including SWITCH, TIMES, BALMOREL, ReEDS, PLEXOS, SOLPH, and ETM, are evaluated based on their objectives and programming considerations. While SWITCH, TIMES, BALMOREL, ReEDS, and PLEXOS focus on long-term economic optimization, SOLPH and ETM are excluded due to insufficient information on their economic goals or exclusive focus on scenarios. The programming of the tools is discussed, with TIMES standing out for its use of GAMS and compatibility with Excel, making it user-friendly. Additionally, considerations of support, adaptability to the Argentine context, and open-source nature are examined. Ultimately, TIMES is recommended as the preferred tool due to its extensive global usage, support from the International Energy Agency (IEA), and adaptability to diverse energy systems, making it well-suited for the analysis in this study.

Conclusions

This work initiates a critical discussion on the Decision-Making Mechanisms for the Expansion of the Argentine Electrical System, aiming to enhance transparency and provide a standardized, economically justified approach. It emphasizes the importance of addressing energy security and climate change in the context of the global energy transition. The methodology involves a literature review and comparative analysis of decision-making processes in Argentina and other countries, utilizing defined attributes for evaluation. The study of technical tools leads to the recommendation of TIMES for its extensive global usage, IEA support, and adaptability to diverse energy systems. The proposed decision-making method for Argentina involves long-term Energy Scenarios, an annual Long-Term Expansion Plan, and a Short-Term Plan, emphasizing stakeholder involvement and excluding political influence. The study highlights Argentina's opportunity for regional leadership in addressing the climate crisis.

References

- Littlechild, S. C., & Skerk, C. J. (2008). Transmission expansion in Argentina 3: The evolution of policy. Energy Economics, 30(4), 1420–1461. https://doi.org/10.1016/j.eneco.2007.12.011
- Perrone, D. (2021). La importancia de las Ampliaciones de las Redes de Transporte Eléctrico. Revista Argentina de Derecho de la Energía, Hidrocarburos y Minería, 29, 133-163.
- Molina, J. D., & Rudnick, H. (2010). Mechanisms and Incentives for Transmission Expansion: an International Overview.
- Lumbreras, S., & Ramos A. (2015). The new challenges to transmission expansion planning. Survey of recent practice and literature review. Electric Power Systems Research, 134, 19–29.
- Späth, L., & Scolobig, A. (2017). Stakeholder empowerment through participatory planning practices: The case of electricity transmission lines in France and Norway. Energy Research & Social Science, 23, 189–198.
- Empresa de Pesquisa Energética. Audiências E Consultas Públicas. Participação Social Audiências e Consultas Públicas. (n.d.). Última vez consultado: 12 de Noviembre de 2022. https://www.epe.gov.br/pt/acesso-a-informacao/participacao-social/audiencias-e-consultas-publicas
- Operador Nacional do Sistema Elétrico. ONS. (n.d.). Última vez consultado: 12 de Noviembre de 2022. http://www.ons.org.br/paginas/energia-no-futuro/suprimento-eletrico
- Krishnan, V., Ho, J., Hobbs, B. F., Liu, A. L., McCalley, J. D., Shahidehpour, M., & Zheng, Q. P. (2015). Co-optimization of electricity transmission and generation resources for planning and policy analysis: Review of concepts and Modeling approaches. Energy Systems, 7(2), 297–332.
- Fuentes, F., & Serra, P. (2022). Chilean Electric Transmission Regulation: From a merchant approach to central planning. Energies, 15(12), 4336.
- "France 2030' Investment Plan – Policies." IEA. Última Vez Consultado: 11 De Diciembre De 2022 https://www.iea.org/policies/14279-france-2030-investment-plan.
- Zenón, E., & Rosellón, J. (2017). Optimal Transmission Planning under the mexican new electricity market. Energy Policy, 104, 349–360. 45. Electricity – Proyectos México. (n.d.). Última Vez Consultado: 12 De Noviembre De 2022. https://www.proyectosmexico.gob.mx/en/how-mexican-infrastructure/investment-cycle/electricity/
- Ringkjøb, H.-K., Haugan, P. M., & Solbrekke, I. M. (2018). A review of modelling tools for energy and electricity systems with large shares of variable renewables. Renewable and Sustainable Energy Reviews, 96, 440–459.57.
- Charles Heaps, S. E. I. (n.d.). Leap. Última Vez Consultado: 12 De Noviembre De 2022. https://leap.sei.org/default.asp?action=tools#
- Ho, J. L., Cole, W. J., & Spyrou, E. (2017). Reeds-Mexico: A capacity expansion model of the Mexican Power System. https://doi.org/10.2172/1398375
- Switch Power System Planning Model. (n.d.). Última Vez Consultado: 12 De Noviembre De 2022. https://switch-model.org/
- "Markal/Times." EnergyPLAN, 30 June 2015. Última Vez Consultado: 17 De Diciembre De 2022. https://www.energyplan.eu/othertools/national/markaltimes/
- Balmorel. The Balmorel Open Source Project. (n.d.). Última Vez Consultado: 12 De Noviembre De 2022. http://www.balmorel.com/
- Regional Energy Deployment System (ReEDS). NREL.gov. (n.d.). Última Vez Consultado: 12 De Noviembre De 2022. https://www.nrel.gov/analysis/reeds/index.html
- PLEXOS: Energy market simulation software: Energy exemplar. PLEXOS | Energy Market Simulation Software | Energy Exemplar. (n.d.).Última Vez Consultado: 12 De Noviembre De 2022. https://www.energyexemplar.com/plexos
- Papadopoulos, C., Johnson, R., & Valdebenito, F. PLEXOS® Integrated Energy Modelling around the Globe.