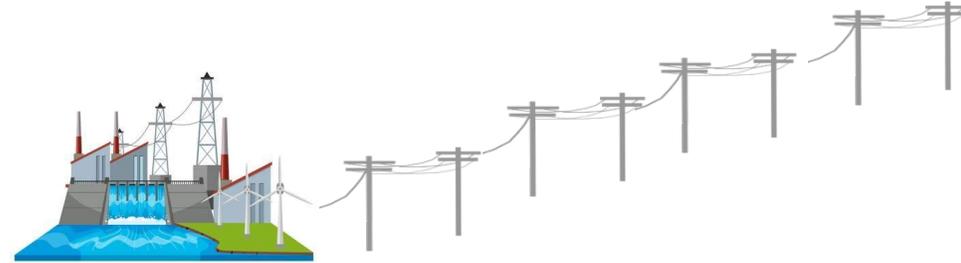


Hydrogen Economy: Perspectives and Potentials

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The Study Group of the Brazilian Electric Sector (GESEL) of the Federal University of Rio de Janeiro was created in 1997 with the objective of developing research and economic analysis for the Brazilian Electric Sector.



One of the main Think Tank of the Brazilian Electrical System

Mission:

Produce and disseminate knowledge, information and studies.

Develop human resources specialized in economic regulation for the Electric Sector.



Vision:

To be an international reference Think Tank.

Products: please refer to www.gesel.ie.ufrj.br

H2 - Global Perspectives

- The global hydrogen market is currently relevant, being estimated between US\$110 and US\$136 billion in 2019, in applications such as: production of fertilizers, products for the food industry and for the petroleum industry, among others.
- The forecast is for a significant growth in the coming years, reaching values up to US\$ 200 billion, driven by the perspective of using hydrogen as a necessary vector to enable the decarbonization of the world economy, to achieve the goals of the Paris Agreement in the 2050 horizon (EPE, 2021).
- Hydrogen has become a priority in the energy and climate strategy of several countries, because it provides an alternative for sectors that are difficult to abate carbon emissions (hard-to-abate sectors) and because it also constitutes an energy vector, enabling energy storage and the coupling of the energy sector to the industry and transport sectors.
- EU acknowledges that it will not be able to produce domestically of all of its H2 demand by 2030 up to 40 GW would be imported (European Hydrogen Strategy 2025-2030). Brazil can be a key player in this new market due its energy sector characteristics and the existing ports infrastructure.

National Agenda

The National Energy Plan 2050 (PNE 2050) recognizes hydrogen as a disruptive technology and a key element in the context of decarbonization of the energy matrix.

The National Energy Policy Council (CNPE) published two resolutions. 1 - CNPE Resolution No. 2 of 2021, indicating the priority for the allocation of R&D resources regulated by ANEEL and ANP to hydrogen. 2 - CNPE Resolution nº 6 of 2021, dealt with the proposal of guidelines for the National Hydrogen Program (PNH2).

Brazil co-leads the United Nations High Level Dialogue on Energy, having presented an energy pact on hydrogen fostering the development of the hydrogen industry and market in the country based on three pillars: i) research, development and innovation policies ; ii) capacity building and training; and iii) a platform for consolidating and disseminating information on hydrogen.

National H2 Program Guidelines - July 2021



Some Electric Sector Enabling Characteristics

Geographical characteristics and energy resources

- Large territorial extension;
- **Huge renewable energy production potential: hydro, solar, wind, biomass;**

Electrical system:

- **Clean electrical matrix (84% of renewable energy in 2020 – ref: BEN 2021);**
- Low cost of renewable energy production;
- **Large existing transmission system (145.600 km) – even with a large expansion plan (184.000km 2025);**
- Presence of several large multinational groups;
- Solid institutional structure with long-term planning (EPE), centralized operation (ONS), consistent and independent regulatory framework (ANEEL), efficient contract clearing system (CCEE) and consolidated financing structure (BNDES);

Research and Development:

- Broad R&D&I network with several financing mechanisms: FINEP, EMBRAP II and fiscal incentives (such as the Lei do Bem);
- **Regulated investment programs for research, development and innovation (ANEEL and ANP).**

Piero Carlo dos Reis

- Currently research associate at GESEL UFRJ, Rio de Janeiro.
 - For two years and half, Piero has worked as a research Associate at Florence School of Regulation - Energy, dealing with hydrogen, EVs and other energy economics & policy topics.
 - Graduated Mechanical engineer at ETH Zurich, with internship experience on power sector planning at IRENA (International Renewable Energy Agency) and Master's thesis at EPFL Energy Centre.
 - He has also designed and contributed as a lecturer to the non-profit online training “Africa Fellowship for Young Energy Leaders” (2021-2022), coordinated by the Renewable Energy Technology Training Institute (RETTI) in Nigeria.
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- Specialised in the fields of energy policies and planning, renewable energy engineering and optimisation models.

IRENA – International Renewable Energy Agency

- The **International Renewable Energy Agency (IRENA)** is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy.
- **With more than 180 countries actively engaged, IRENA promotes renewable resources and technologies as the key to a sustainable future and helps countries achieve their renewable energy potential.**
- **Barbara Jinks** - Programme Officer – Green Gas Delivery and Use, IITC International Renewable Energy Agency (IRENA)
 - She has over 35 years in the gas industry in natural gas, biomethane and hydrogen. She has worked in a range of positions from field-based to international corporate roles in many different parts of the energy industry and now works with the intergovernmental organisation, IRENA.
 - She works now in the Innovation and Technical Centre with intergovernmental organisation IRENA, where she helps IRENA understand the role of green gases and the use of the gas grid to assist the decarbonisation of energy. She has degrees in engineering, environmental science and law, all of which she says are essential in understanding the role of energy in addressing climate change.
- **Pablo Ralon** - Programme Officer, Renewable Energy Cost Status & Outlook, IITC International Renewable Energy Agency (IRENA)
 - He has studied chemical engineering and holds a master's degree in sustainable energy systems.
 - He has worked in the analysis of renewable energy technology and markets at international level for more than 10 years.
 - He is currently an analyst at IRENA's Renewable Energy Cost Status and Outlook team where he contributes to systematically research, collect and analyse data on the project cost and performance of renewable energy technologies to help inform policy-makers. He also tracks the renewable energy and electricity storage markets and their technology and financial development.



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