Eletrobras
TCFD Report
2021

Eletrobras

Contents

Foreword

The climate challenges we were faced with in 2021 were a timely reminder of an undeniable reality: it will take sound governance, accountability and immediate and substantial investment to counter the impacts from climate change, which are increasingly being felt both in Brazil—last year the country experienced one of the severest droughts in recent history, especially in the South and Southeast—and around the world.

Eletrobras is taking climate change seriously and responsibly. We have expanded our research, projects and programs to generate clean and sustainable electricity. These investments align with our Group Strategic Plan, which outlines clear guidelines for action on climate issues.

In this report we provide an objective account of these initiatives and their outcomes, how they integrate with our sustainability strategy, and the plans we have outlined for our efforts in this area. In developing this report, we have followed the recommendations from the Task Force on Climate-Related Financial Disclosures (TCFD).

The initiatives we describe in this publication are responsive to society's growing demand for all companies to develop and deploy clean energy technologies. The Eletrobras Group has long been ahead of the curve in developing renewable, low-emission generation projects, which already account for 97% of our total generation capacity.

In updating our risk matrix during the year, we used a transparent and participatory process that included climate issues related to our business. And we continued to monitor our social and environmental impacts and to implement initiatives to reduce or mitigate them.

As we celebrated our 60th anniversary in the year, we remained focused on building a sustainable future for all, an imperative for our business success. These efforts led to a major milestone for Eletrobras in 2021 with the National Congress approving our capitalization program, which proceeded to implementation in 2022.

This transformation is delivering on our goal to lead the power sector in Brazil, both in generation and transmission and in sustainability. We remain committed to our mission of creating a clean and energy-abundant future.

Luiz Augusto Figueira
Chief Corporate Management & Sustainability Officer

Introduction

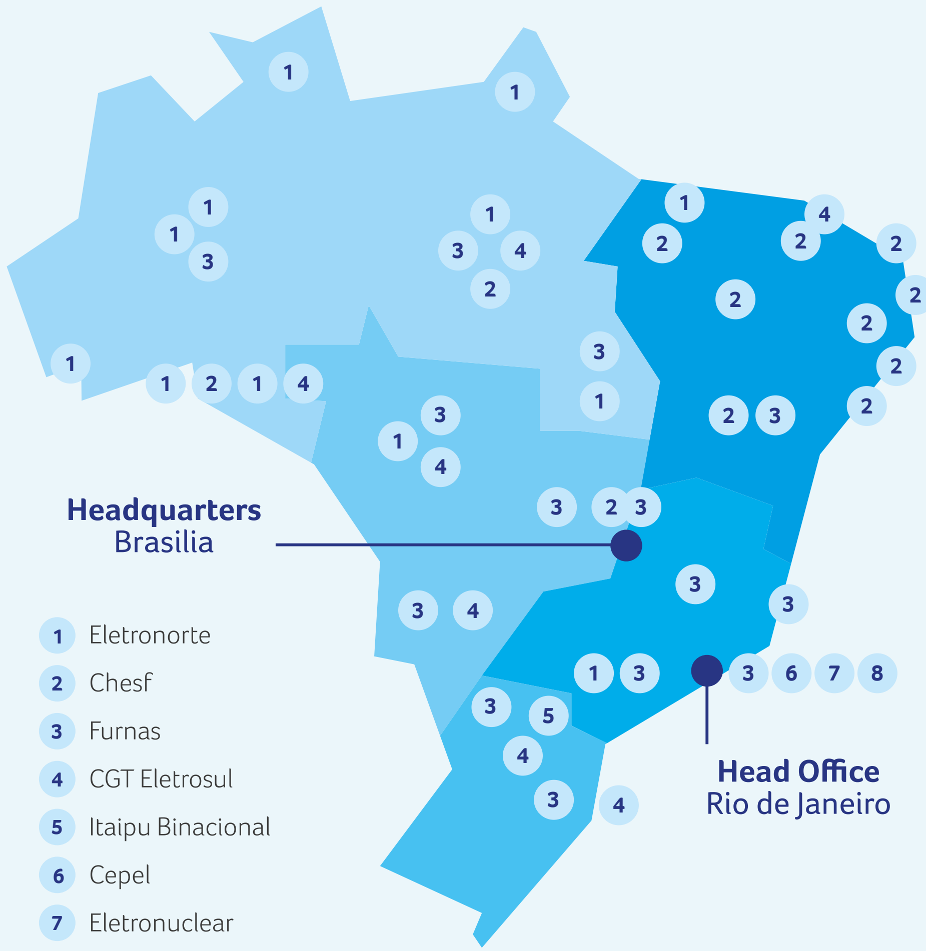
Eletrobras (Centrais Elétricas Brasileiras S/A) has a nation-wide presence in Brazil and has stakes in assets across South America. We operate 28% of Brazil's generation capacity and are the industry leader in generation and transmission on the continent. In 2021 we supported 13,433 direct jobs.

A major player in Brazil's energy market, Eletrobras plays a significant role in tackling climate change. Approximately 97% of our generation capacity consists of low-emission sources, helping to make Brazil's energy mix one of the cleanest in the world.

Vision

To be an innovative, clean energy company, recognized for excellence and sustainability.

Our presence by the numbers



1 Eletronorte
2 Chesf
3 Furnas
4 CGT Eletrosul
5 Itaipu Binacional
6 Cepel
7 Eletronuclear
8 Eletropar

97%
low-emission generation capacity:

- **91.6% hydro**
- **3.9 % nuclear**
- **1.4% wind**
- **0.1% solar**

28%
of Brazil's generation capacity:

- **39% North**
- **21% Northeast**
- **20% Southeast**
- **16% South**
- **3% Midwest**

Generation
50,515.2 MW
installed capacity in 2021
178,812 GWh generated
8.4% < 2020
105 power plants in operation

Transmission
74,088 km
of transmission lines

In our 2021 Annual Report we presented our climate strategies and initiatives and how they support ESG (environmental, social and governance) performance, the Sustainable Development Goals (SDGs), and targets under the Paris Agreement (COP 21/2015).

Eletrobras is a member of several external forums where we share good practices and contribute to discussions around climate change, including the Brazilian Business Council for Sustainable Development's (CEBDS) Thematic Chamber on Energy and Climate Change, the Global Compact's Caring for Climate initiative, and the Brazilian Forum on Climate Change.

This is Eletrobras's second annual TCFD Report, based on our disclosures to the Carbon Disclosure Project (CDP)—an independent not-for-profit organization which acts as an intermediary between shareholders and corporations on climate change issues. This report is for the period from January 1 to December 31, 2021.

The report is structured around the 11 TCFD-recommended disclosures, across four thematic areas: governance, strategy, risk management, and metrics and targets.

In 2021 Brazil's National Congress approved Eletrobras's capitalization program, **reducing the government's stake in the company from 51% to 45%**.

Governance

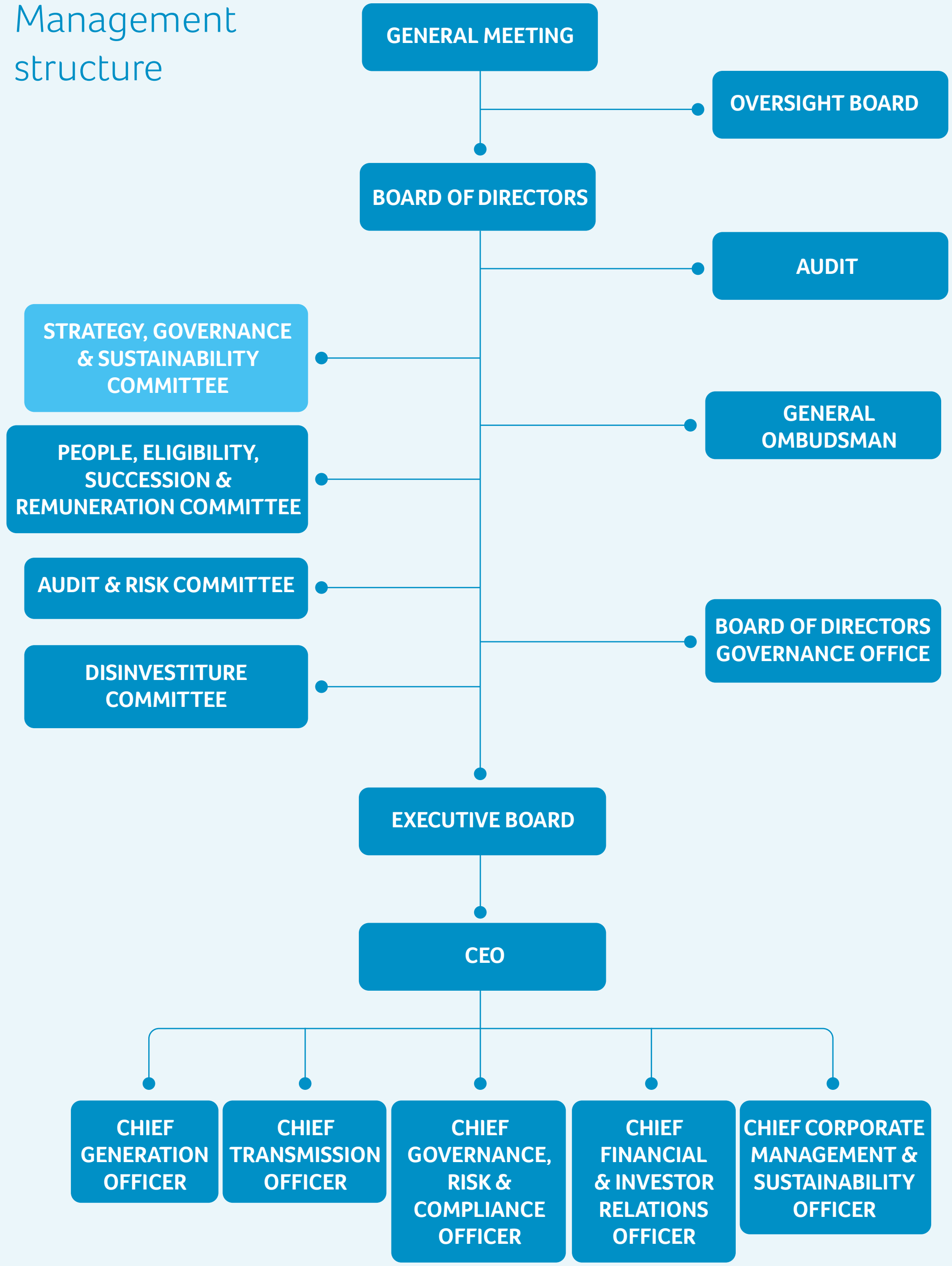
Effective governance is key to delivering long-term value by reconciling and enhancing financial, social and environmental performance. As a publicly traded company, Eletrobras operates in accordance with internationally recognized standards of governance that meet the regulations of the markets where we operate. This ensures our business is sustainable and aligned with the principles of transparency, equity, accountability and corporate responsibility.

Board oversight of climate-related risks and opportunities

The Board of Directors (BoD) and the executive team are responsible for overall governance and short, medium, and long-term planning. The Strategy, Governance & Sustainability Committee, which is directly under the BoD, oversees progress on environmental, social, and governance (ESG) goals, including climate change, indicators related to the 2030 Agenda, and Sustainability Policy issues.

The Board's monthly meetings, and extraordinary meetings as needed, also include dedicated sessions on ESG and technology, an opportunity for subject matter-specific discussions on sustainability.

Management structure



The Strategy, Governance & Sustainability Committee is made up of three Board members who work to enhance the effectiveness and quality of Board decisions, including climate-related decisions. The Chief Corporate Management & Sustainability Officer is among its members. The Committee is responsible for:

- Advising on corporate sustainability strategies
- Recommending and tracking progress on corporate sustainability targets and initiatives
- Reviewing company policies and standards on social and environmental matters
- Assessing and recommending measures to mitigate social and environmental risks, working with the Statutory Audit & Risk Committee
- Evaluating our innovation and Research & Development (R&D) strategy
- Assisting in the development of our Annual Report, ensuring that it meets internationally accepted standards
- Tracking our performance in indexes such as the Brazilian stock exchange B3's Corporate Sustainability Index and the Dow Jones Sustainability Index (DJSI)
- Reviewing our Strategic Plan and Business & Management Master Plan (PDNG), and overseeing delivery of strategic projects and targets, recommending remediation measures when necessary

In 2021, the BoD approved an update to the PDNG to include our Sustainability 4.0 Program as one of its strategic initiatives. This program, which began in 2020, will support the Group in delivering excellence in sustainability and creating value for stakeholders through projects in areas such as the energy transition and climate change.

Our Environmental Protection and Energy Transition & Greenhouse Gas (GHG) Emissions Offsets projects are among the initiatives within the program. These projects include studies toward improving our management of climate and environmental issues such as our carbon footprint, carbon pricing, water footprint, product and service lifecycles, and our approach to valuing ecosystem services. They also include initiatives aimed at improving energy efficiency and our waste and water management practices, reducing and offsetting GHG emissions, and reducing electricity and fossil-fuel consumption.

The PDNG is an extension of the Eletrobras Group Strategic Plan. With a five-year horizon, it **addresses current challenges facing Brazil and the power sector.** It establishes strategic guidelines and business performance goals, including in relation to climate change and GHG reduction.

Management’s role in assessing and managing climate-related risks and opportunities

The Chief Corporate Management & Sustainability Officer is among the members of the Executive Board, which includes the CEO and up to six executive officers appointed by the BoD. Executive Board members serve a unified term of two years, renewable for a maximum of three consecutive terms in accordance with the Government-Owned Companies Act (Law no. 13 303/2016).

The Executive Board has committees and working groups that are created on an as-needed basis to conduct in-depth assessments on management-related matters. One of these is the Strategic Working Group on Climate Change.

The Board of Directors sets annual **performance goals** for the CEO, executive officers, managers, and employees based on indicators measured at the corporate, governance-body and business-unit levels. These goals are factored in our **Variable Compensation Program**. A set of absolute and relative indicators measure the extent to which employees are engaged around our strategy and policies across the financial, operational, environmental (including climate change), social and governance dimensions.

The primary duties of the Chief Corporate Management & Sustainability Officer are to implement sustainability management practices and represent Eletrobras in national and international forums on sustainable development. They also submit quarterly reports on the company’s performance on climate-related matters to the Strategy, Governance & Sustainability Committee.

Strategy

Eletrobras develops strategic plans for the short- (zero to five years), medium- (five to ten years) and long-term (ten to fifteen years) horizons.

Our Group Strategic Plan provides a common source of guidance for all of these, including our long-term vision (2020-2035), trends and risks. Our most recent strategic plan was developed in 2020. The estimates and assumptions informing the plan reflect our expectations about current and future events, financial and non-financial trends, the potential that exists within the Eletrobras Group, and shareholders' aspirations.

The Group Strategic Plan is then translated into a short- and medium-term plan with a five-year horizon (PDNG), which is revisited every 12 months. PDNG 2022-2026, developed in 2021, sets out guidelines, goals and initiatives supporting the nine Sustainable Development Goals (SDGs) and our voluntary commitment to the 2030 Agenda.

As part of our climate strategy, we actively participate in external forums such as the Brazilian Forum on Climate Change, the UN Global Compact Action Platform for Climate, and the CEBDS Thematic Chamber on Energy and Climate Change. We are a signatory of the Position Paper on Carbon Pricing Mechanisms within the Business for Climate Initiative (IEC), and its Open Letter – Private Sector Support for Carbon Pricing in Brazil. Since 2010 we have voluntarily responded to the CDP questionaire, and since 2018 we have supported the TCFD recommendations, which form the basis of this report.

Prioritized SDGs:

Climate-related risks and opportunities the organization has identified over the short, medium, and long term

Eletrobras classifies the risks to which it is exposed based on the magnitude of impact and the likelihood of occurrence. Intersecting these factors determines the level of exposure to each risk, informing the development of a risk matrix. These criteria are applied both to our direct operations and to impacts from our broader supply chain.

Eletrobras classifies each identified risk as critical, high, medium, low, or minimal depending on the degree of three different types of impact: financial, economic, and reputational. Impacts are considered critical for our operations if financial losses would exceed R$ 213 million. Other factors used to classify risks include their influence on our strategic objectives and how they affect our reputation.

Risks related to climate change adaptation and mitigation are also included in Eletrobras's risk matrix. The potential financial impacts of these risks include:

1. Loss of revenue – due to reduced generation and transmission, or damage to structures from extreme weather events
2. Fines and sanctions – for failing to deliver contract power
3. Disinvestment or loss of competitiveness – if our business model is not aligned with best practices

Eletrobras regularly conducts assessments of its vulnerability to these risks and of the financial impacts of adapting to and mitigating climate change. We are currently carrying out studies to model physical and regulatory impacts from climate change on our generation and transmission assets. Our models estimate financial impacts of around R$ 2.6 billion for physical risks and R$ 600 million for regulatory risks.

Eletrobras is also working to factor climate-change variables in investment decisions.

Climate-related risks and financial impacts

Type of transition risk	Political and legal
Risk	Carbon pricing mechanisms
Potential impact	Higher direct costs
Time horizon	Short term
Likelihood	Probable
Magnitude of impact	Low
Estimated financial impact (R$)	R$ 603,361,000
Explanation of financial impact	The estimated financial implications of this risk relate to the annual cost of carbon taxes (in *reais*). This cost was calculated based on generation emissions and financial data from Amazonas GT, CGT Eletrosul, Eletronuclear and Furnas power plants. The calculation assumes a carbon price of US$ 20.00/t CO_2e. The analysis shows that the greatest increase in costs/operating expenses from carbon taxation would be felt by Mauá 3 (AM) at 73.3% and Candiota III (RS) at 71.7%, followed by Aparecida (AM) at 45.4%, Santa Cruz (RJ) at 29.1%, and Angra 1 and 2 TPP (RJ) at 0.007%.
Cost of responding to the risk (R$)	R$ 216,000,000
Mitigation and adaptation measures	Eletrobras has directed efforts toward modernizing our thermal power plants to improve performance and efficiency and reduce GHG emissions and air pollution. For example, we implemented combined cycle technology at the Santa Cruz thermal power station, adding 175 MW of generation capacity to the National Grid; and an upgrade at the Candiota III thermal power station to improve coal quality and increase the power output from the plant by approximately 10%, while reducing consumption of this fossil fuel. The cost of our response to this risk is proportional to the amount of effort in implementing these initiatives. In addition, we have continued to target investment to renewable energy to sustain our low emissions levels. Eletrobras has set a target to keep the share of clean energy sources (solar, wind, hydro and nuclear) in our portfolio above 97%, through our Energy Transition Program.

Climate-related risks and financial impacts

Type of physical risk	Acute
Risk	Drought
Potential impact	Loss of revenue as a result of reduced production capacity
Time horizon	Medium term
Likelihood	Probable
Magnitude of impact	Medium-low
Estimated financial impact (R$)	2,653,000,000
Explanation of financial impact	Unfavorable hydrologic conditions could adversely affect our hydroelectric generation assets and prevent us from maintaining our contract capacity, causing financial impacts. The financial impact estimate is based on potential impacts for 2022 before applying any mitigation measures and trading strategies, which could effectively hedge the company from these risks, as determined in terms of the opportunity cost assessed within the Brazilian power sector. The financial-impact estimate was calculated for a reduction in hydroelectric generation capacity and the effects from the Generation Scaling Factor (GSF), a formula that calculates losses as a result of a facility's inability to use its full installed capacity and the need to purchase electricity from other sources at expected electricity prices.
Cost of responding to the risk (R$)	61,000,000
Mitigation and adaptation measures	Eletrobras has commissioned a study to identify river basins in which our generation assets are particularly exposed to climate-related risks. The study will evaluate the risks of reduced streamflow in the short and medium term (2030 and 2050) and the potential impacts on hydroelectric resource and the guaranteed capacity of our hydroelectric assets. The study will provide Eletrobras with important inputs for adapting existing assets and better planning hydroelectric plant expansions.

Climate-related opportunities and financial impacts

Type of opportunity	Markets
Opportunity	Access to new markets
Potential impact	Increased revenues through access to new and emerging markets
Time horizon	Short term
Likelihood	Virtually certain
Magnitude of impact	Medium
Estimated financial impact (R$)	Minimum: 195,311,144 Maximum: 5,566,367,599
Explanation of potential financial impact	Certain positive financial implications from our strategy have been identified and calculated based on the emissions avoided by the following projects (over a ten-year period): Jirau (RO), estimated at 4,362,995 tCO_2e; Teles Pires (PA/MT), estimated at 7,073,640 tCO_2e; and Santo Antônio (RO), estimated at 4,015,196 tCO_2e. The minimum and maximum Certified Emission Reductions (CERs) traded in 2021 (2.57 €/CER) were converted to Brazilian currency at an exchange rate of R$ 6.32.
Implementation cost (R$)	2,858,056
Implementation strategy	We plan to certify additional renewable generation facilities within the Clean Development Mechanism (CDM), and to prospect for new buyers for our carbon credits. The cost of implementing this opportunity relates to the cost of consulting and assurance services to certify the credits.

Type of opportunity	Markets
Opportunity	Access to new markets
Potential impact	Increased revenues through access to new and emerging markets
Time horizon	Short term
Likelihood	Virtually certain
Magnitude of impact	Medium
Estimated financial impact (R$)	1,796,977
Explanation of potential financial impact	The potential financial impact is based on I-RECs* sold in 2021 (1,129,049 MWh). Four potential options for selling our I-RECs have been identified: via public auctions (sale), bilateral negotiations, or participation in end beneficiary auctions, or otherwise for neutralizing our own emissions (reducing self-consumption).
Implementation cost (R$)	248,391
Implementation strategy	The I-REC sales business involves fixed and variable costs, including those incurred in certifying projects with the Totum Institute and joining the I-REC Standard Platform. Other costs include subsequent certification for sale on the the SISREC and I-REC platforms. The opportunities listed above have already been implemented.

Climate-related opportunities and financial impacts

Type of opportunity	Markets
Opportunity	Access to new markets
Potential impact	Increased revenues through access to new and emerging markets
Time horizon	Short term
Likelihood	Virtually certain
Magnitude of impact	Medium
Estimated financial impact (R$)	149,541,278
Explanation of potential financial impact	The potential financial impact refers to the sale of Renewable Energy Certificates (RECs) from all renewable power plants.
Implementation cost (R$)	
Implementation strategy	The I-REC sales business involves fixed and variable costs, including those incurred in certifying projects with the Totum Institute and joining the I-REC Standard Platform. Other costs include subsequent certification for sale on the the SISREC and I-REC platforms. The opportunities listed above have already been implemented.

* Renewable Energy Certificates (RECs) are certificates of proof that a certain amount of electricity has been produced from a renewable source. Each REC is proof that 1 MWh of renewable electricity has been generated and injected into the grid. The REC market was first introduced in Brazil in 2011, and has since grown exponentially, especially following the launch of the I-REC Service—a global electricity environmental attribute tracking system—and the changes introduced in the Brazilian GHG Protocol Program, which now accepts RECs as GHG offsets.

The data used to calculate REC sales are official generation data provided directly by the Electric Power Trading Chamber (CCEE), the Brazilian Wind Power Association (ABEEÓLICA), and the Brazilian Clean Energy Association (ABRAGEL).

Impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning

PDNG 2022-2026 addresses, among other things, climate-related opportunities, risks and impacts. In particular, the plan takes account of climate-related issues affecting rainfall patterns and water and wind resource—all factors that can impact our generation and transmission operations.

The PDNG includes strategic guidance on expanding the energy generation business within the Eletrobras Group. It prioritizes investment in clean energy sources and practices and processes designed to mitigate impacts from climate change.

We have also implemented strategic initiatives for mitigating climate change, protecting the environment, and advancing the energy transition as part of our Sustainability 4.0 Program, an integral part of PDNG 2022-2026. These initiatives aim to transition our company towards a low-carbon economy through the use of clean and renewable energy sources.

Eletrobras has also invested in certifying power plants to issue renewable energy certificates (RECs). In 2021 we traded approximately 1.2 million certificates, including I-RECs and RECFYs (Eletrobras Furnas' proprietary certificates - learn more on page 29). We are also in the final stages of developing a Decarbonization Solutions Policy for the Eletrobras Group.

These ongoing and planned initiatives all support our goal of playing an active role in the energy transition and expanding our renewables portfolio.

They are also improving our alignment with industry best practices, which include transparent and straightforward communication with the market and society about progress. For example, we provide a wide range of communication channels and regularly publish content about our approach to managing climate-change issues.

The **PDNG establishes performance metrics such as percent clean generation capacity and GHG emissions intensity** (tCO_2/MWh), supporting our vision "To be an innovative, clean energy company, recognized for excellence and sustainability." These metrics are tracked to ensure we deliver the best outcomes for the company, the climate, and society.

Resilience

Eletrobras is conducting further research and scenario modeling to reassess the resilience of our strategies to climate change-related risks and opportunities—these studies are expected to be completed in 2023.

Risk management

Eletrobras has implemented an Integrated Risk Management system to prevent events that could adversely impact our ability to achieve our business objectives and deliver results. We work to preserve value creation and sustainable development, and to transparently disclose information to the market, shareholders, and the general public.

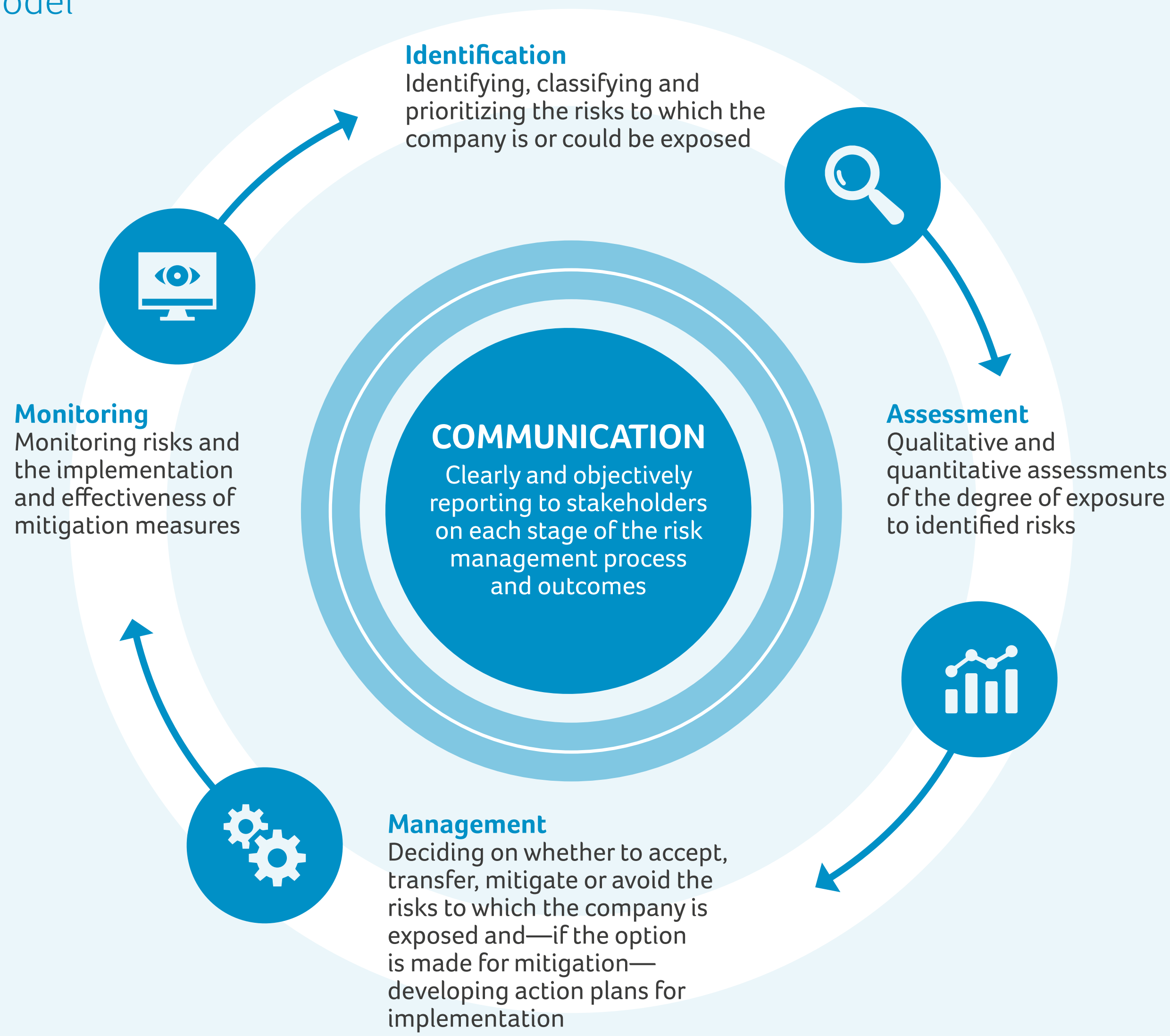
Processes used by the organization to identify, assess, and manage climate-related risks

Climate-related risk management practices in the Eletrobras Group are governed by a Corporate Risk Management Policy under the oversight of our parent company. This ensures that individual risk matrices are developed consistently Group-wide.

The individual risk matrices of each subsidiary are compiled into a common corporate risk matrix. Risk matrices are developed in a five-stage process that follows the recommendations outlined in ISO 31000: 2018 and COSO ERM (of the Committee of Sponsoring Organizations of the Treadway Commission). Our consolidated risk matrix is then validated by the Executive Board and Board of Directors.

In the most recent annual revision of our risk matrix, each subsidiary was tasked with identifying business-specific risks, applying the standard Group policy to its own circumstances. This new approach allowed the top management of each Group company to evaluate its risk appetite and factor its own business circumstances in the development of the matrix, in addition to our common core risks—business, financial, operational and compliance.

Risk management model



In each of these steps, operations teams consider and assess social and economic aspects, including climate-related aspects affecting their day-to-day processes and activities. We also consider prospective climate risks and their potential impacts on the business.

Risk matrix

BUSINESS

- G&T Businesses
- New business
- Electricity market
- Climate change (mitigation)
- Climate change (adaptation)
- Associates
- Governance

FINANCIAL

- Liquidity
- Credit
- Market

OPERATIONAL

- Human capital
- Social and environmental
- Legal
- Business continuity

COMPLIANCE

- Ethics and integrity
- Laws and regulations

A risk assessment datasheet is created for each identified risk, showing its related impacts and significance for the business. The assessment sheet also describes the causes, the likelihood of occurrence, ongoing mitigation action, and other information as necessary.

Climate risks are divided into the following categories:

- Current regulations
- Emerging regulations
- Technology
- Legal
- Market
- Reputational
- Physical, acute
- Physical, chronic

Eletrobras has taken a number of risk mitigation measures, including assessments to identify and evaluate where we are vulnerable to climate change. These assessments are used as inputs in selecting and ranking new generation and transmission projects, and in reviewing existing projects.

As a result of our efforts to assess and address climate change adaptation risks, the likelihood of occurrence has decreased from high in 2019 to medium in 2021. The magnitude of impacts, however, is still considered critical, as the potential losses are estimated to be in excess of R$ 213 million.

These assessments have factored in the effectiveness of previous mitigation efforts. Under our risk management policy, the likelihood of occurrence of a given risk is based on the most likely of its underlying factors, and the magnitude of impact is based on the consequences with the most severe impacts.

The overall magnitude of impact takes economic, financial, and reputational factors into account.

When the likelihood and magnitude of impact have been determined, they are intersected together to plot the relevant risk on a prioritization heat map. Our management uses these heat maps, along with the relevant risk reports, to track changes in each risk.

Climate change adaptation

In assessing climate-change risks, we consider the potential impacts from legal and regulatory developments in Brazil. Regulations on the carbon credit market are one example of potential regulatory developments that could have both a positive and a negative effect on our operations.

The lack of methodologies, official standards, studies and or/data to enable us to incorporate future climate-change scenarios into our strategic planning and in project design/reviews in the power sector, is the primary risk relating to climate change adaptation.

There are also significant technical, regulatory and methodological hurdles, both in Brazil and internationally, in implementing measures to reduce our vulnerability to and mitigate impacts from climate change on Group companies' generation and transmission operations.

The existing and potential future regulations that were factored in building our climate risk matrix include:

- Brazil's National Policy on Climate Change, established by Law no. 12 187/2009 and regulated by Decree no. 7 390/2010 and no. 11 075/2022, which calls for a National Greenhouse Gas Reduction System and establishes procedures for developing Sectoral Climate Change Mitigation Plans.
- Bill no. 2 148/2015, which is currently being debated in the National Congress, introducing regulations on the Brazilian Emissions Reduction Market (MBRE) under the National Policy on Climate Change.
- The new Nationally Determined Contribution (NDC) submitted by Brazil in 2022, which maintains its commitment to reduce emissions by 37% below 2005 levels by 2025. The country has also pledged to cut its greenhouse gas emissions by 50% by 2030 and has brought forward its net zero target to 2050. As an important player in the Brazilian power sector, the Eletrobras Group can play an important role in helping to meet these national commitments.

Already boasting a 97% renewable power generation mix, Eletrobras continues to explore new opportunities for renewable business and products.

We also carry out annual assessments on the potential financial impacts from future carbon tax scenarios.

All Eletrobras Group companies have invested in R&D projects in this area. For example, CGT Eletrosul has developed a pilot study for transmission systems, titled "Enhancing Climate Services for Infrastructure Investments (CSI)", in a collaboration with the German International Cooperation Agency (GIZ).

Among the climate-change risks we consider in our risk matrix is hydrological risk, as severe weather events can have a direct impact on our hydroelectric power output. We mitigate this risk through energy hedging, a financial transaction designed to protect against short-term market fluctuations.

Main impacts and action taken

Among the primary impacts from climate change on our generation and transmission operations is the potential loss or temporary unavailability of our physical assets, leading to a loss of revenue and competitiveness. A number of measures have been implemented or are planned to address these impacts. These include:

- Conducting studies to identify and assess the vulnerability of the business to climate change
- Funding R&D projects to assess climate services affecting Eletrobras Group infrastructure
- Including climate change adaptation as a factor in strategic planning
- Including vulnerability data when reviewing generation and transmission projects and designs
- Creating a working group to review and compile vulnerability data to be factored in project design/reviews
- Developing action plans to inform measures to minimize the vulnerability of our operations to climate change

Failing to incorporate greenhouse gas emissions management in our strategic planning and in project design/reviews, and failing to implement emissions monitoring and mitigation/offsetting measures in our generation, transmission and administrative activities, are the primary climate change mitigation risks for Eletrobras Group companies. Measures have been implemented or are planned to address this risk. These include:

- Compiling GHG emissions inventories
- Setting targets to reduce/maintain GHG emissions levels
- Implementing action plans and measures to manage GHG emissions
- Sponsoring research on and exploring new technologies, including technologies to reduce transmission losses
- Fostering discussion, primarily at the regulatory level, to improve management of transmission losses
- Implementing initiatives to offset emissions via carbon credits, I-RECs and/or forest offsets
- Keeping up to date on methodologies, standards and regulations relating to GHG management
- Monitoring future emissions-related regulatory developments to inform our strategic planning
- Establishing GHG emissions criteria for inclusion in our methodology for selecting and ranking new generation and transmission projects
- Including GHG emissions data in developing and reviewing generation and transmission projects and designs

Engaging suppliers and other partners

As strategic stakeholders, Eletrobras works closely with suppliers to ensure they are aligned with our social and environmental guidelines. Our related initiatives include:

- **Assessing suppliers' social and environmental practices, including GHG emissions, at least annually:** all newly onboarded suppliers undergo due diligence on ESG aspects, including their practices on climate change, as a requirement under their contracts. The due diligence process assesses suppliers' commitment and strategies, and the extent to which they are aligned with the Eletrobras Group's standards and practices, including our Code of Ethical Conduct & Integrity and Supplier Code of Conduct.
- **Engagement campaigns to raise supplier awareness about climate change:** since 2010 we have held annual editions of the Eletrobras Group National Supplier Conference to provide information on and discuss environmental, social and governance matters. Due to the pandemic, the 2021 edition was held online, with 500 delegates attending. During the event, we stressed the importance of all suppliers engaging around environmental issues, including climate change, and introduced new communications channels such as our "Connected Suppliers" newsletter and Supplier Portal.
- **Engaging with other partners in the value chain:** Eletrobras has a mandate to manage Brazil's National Energy Conservation Program (PROCEL), established by Interministerial Ordinance no. 1 877/1985. Annual PROCEL Funding Allocation Plans provide guidance on the use of funding in energy efficiency projects across targeted industries—manufacturing, sanitation, buildings, public lighting, education and marketing—and in developing energy-efficient equipment in different PROCEL-labeled categories. Funded projects are required to be aligned with the following principles:
  - Energy efficiency is an important lever for Brazil's technological, economic, environmental and social development, helping to use natural resources more efficiently and to increase energy security
  - By investing in energy and resource efficiency, consumption and ultimately costs are reduced
  - Energy efficiency improvements mean current electricity demand can be reliably met, while delaying the need for power grid investments
  - Developing more efficient technology will make Brazilian industry more competitive, while benefiting consumers and minimizing environmental impacts

Metrics and targets

Metrics used to assess climate-related risks and opportunities in line with our strategy and risk management process

Risk/Opportunity	Financial category	Climate-related category	Time horizon	Metric	Unit of measure	Basis for inclusion
Shifts in precipitation and variability in weather patterns	Expense	Water	Medium term	Higher direct costs	R$	Climate and weather conditions directly affect inflows into our hydroelectric dams and, ultimately, their generation capacity. Amount: R$ 2.653 billion
Carbon pricing mechanisms	Assets	GHG Emissions	Short term	The annual cost of carbon taxes has been calculated based on emissions, power output and financial data for Amazonas GT, CGT Eletrosul, Eletronuclear and Furnas power plants, assuming a carbon price of US$ 20.00/tCO_2e.	R$	The most significant regulatory risk is related to the possibility of carbon taxes being introduced in Brazil. If any new emissions regulations and carbon taxes are introduced, Eletrobras could be affected as 1,519 MW of our generation capacity comes from coal, oil and gas-fired power plants. Amount: R$ 603.361 million

Risk/Opportunity	Financial category	Climate-related category	Time horizon	Metric	Unit of measure	Basis for inclusion
Access to new markets	Revenue	Adaptation/ Value creation	Short term	Increased revenues through access to new and emerging markets.	R$	Eletrobras has identified a climate-related opportunity to issue Certified Emissions Reductions (CERs). Our company could financially benefit from participating in the CDM cap-and-trade system (in which permits are given via the governments of Kyoto Protocol signatories). Eletrobras has three hydroelectric power plants that are certified to issue carbon credits: Jirau (installed capacity: 3,750 MW), Teles Pires (installed capacity: 1,820 MW) and Santo Antônio (installed capacity: 3,568.3 MW)—the fourth largest hydroelectric dam in Brazil and one of the largest in the world. **Financial impact** Minimum: R$ 195.311 million Maximum: R$ 5.566 billion
Access to new markets	Revenue	Adaptation/ Value creation	Short term	Increased revenues through access to new and emerging markets.	R$	Eletrobras sees an opportunity in issuing I-RECs. We currently have 21 plants that are certified and eligible to issue I-RECs. Seven are owned by Furnas (the Itumbiara dam, straddling the border between Minas Gerais and Goiás; the Serra da Mesa dam in Goiás; and five wind farms within the Fortim cluster in Ceará), and the remainder are owned by Chesf (Casa Nova A, Casa Nova II and Casa Nova III, in Bahia; Apolônio Sales, in Alagoas; Boa Esperança, along the border between Piauí and Maranhão; Luiz Gonzaga, in Pernambuco; Sobradinho, in Bahia; Xingó, along the border between Alagoas and Sergipe; an the Paulo Afonso Complex—four hydroelectric dams—in Bahia). In June 2021 Furnas launched a proprietary platform to issue RECFY Certificates. **Financial impact** R$ 1.796 million

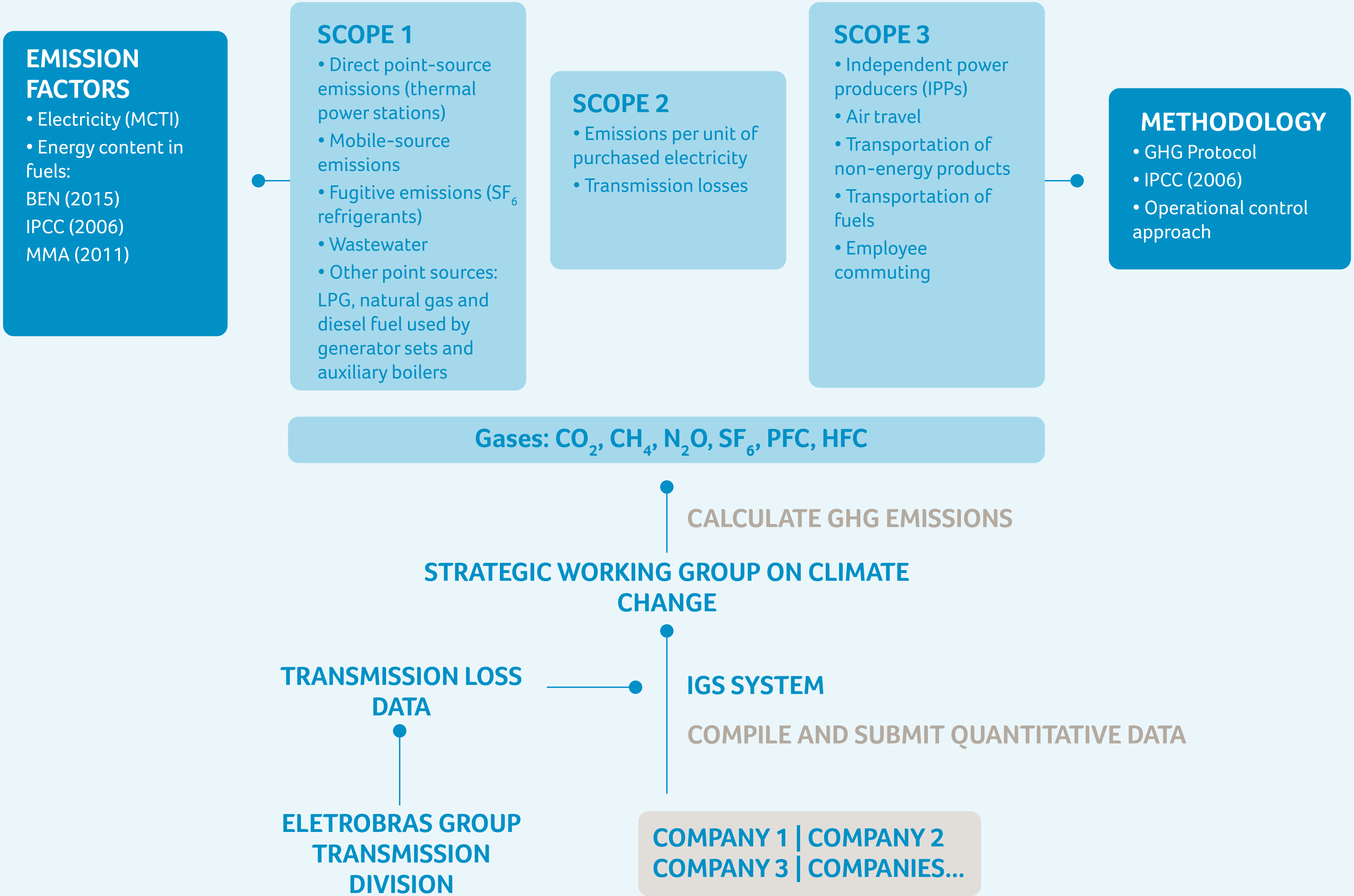
Risk/Opportunity	Financial category	Climate-related category	Time horizon	Metric	Unit of measure	Basis for inclusion
Access to new markets	Revenue	Adaptation/ Value creation	Short term	Increased revenues through access to new and emerging markets.	R$	The potential financial impact relates to the sale of Renewable Energy Certificates (RECs) from renewable power plants in 2021. **Financial impact** R$ 149.541 million

Greenhouse gas emissions and related risks

The Eletrobras Group Greenhouse Gas Emissions Inventory follows the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and the guidelines of the Greenhouse Gas Protocol Brazil, an internationally recognized corporate accounting and reporting framework.

Eletrobras has compiled and published inventories on its website since 2009. The complete historical series can be viewed here.

Scope	Metric	2019	2020	2021
Scope 1	(tCO_2e)	5,227,207	4,164,151	5,955,500
Scope 2	(tCO_2e)	659,298	503,305	949,728
Scope 3	(tCO_2e)	10,879	1,378,753	1,377,403


EMISSION FACTORS
• Electricity (MCTI)
• Energy content in fuels:
BEN (2015)
IPCC (2006)
MMA (2011)
SCOPE 1
• Direct point-source emissions (thermal power stations)
• Mobile-source emissions
• Fugitive emissions (SF_6 refrigerants)
• Wastewater
• Other point sources: LPG, natural gas and diesel fuel used by generator sets and auxiliary boilers
SCOPE 2
• Emissions per unit of purchased electricity
• Transmission losses
SCOPE 3
• Independent power producers (IPPs)
• Air travel
• Transportation of non-energy products
• Transportation of fuels
• Employee commuting
METHODOLOGY
• GHG Protocol
• IPCC (2006)
• Operational control approach
Gases: CO_2, CH_4, N_2O, SF_6, PFC, HFC
CALCULATE GHG EMISSIONS
STRATEGIC WORKING GROUP ON CLIMATE CHANGE
TRANSMISSION LOSS DATA
IGS SYSTEM
COMPILE AND SUBMIT QUANTITATIVE DATA
ELETROBRAS GROUP TRANSMISSION DIVISION
COMPANY 1 | COMPANY 2
COMPANY 3 | COMPANIES...

Targets used by the organization to manage climate-related risks and opportunities and performance against targets

Disclosure	Unit of measure	Historical			Targets		Status in 2021	Targets for 2022 – Ongoing initiatives
		2019	2020	2021	2021	2022		
Relative Generation Availability (DISPGR)	Rate	1.060	1.064	1.064	1.000	1.000	Target met. For the third consecutive year we exceeded our operational target for relative generation availability.	Preventive action to meet the generation availability requirements established by the regulator.
GHG emissions from Eletrobras-owned thermal power plants per unit of net electricity generated (tCO_2e/ MWh)	%	0.62	0.60	0.88	0.59	0.58	Target not met.	Implement our Sustainability 4.0 Program and Energy Transition Project.
GHG emissions from fossil fuel combustion by vehicle fleets	tCO_2e	11,374	8,835	10,028	8,747	8,659	Target not met.	Implement our Sustainability 4.0 Program and Energy Transition Project
Share of clean energy sources (solar, wind, hydro, nuclear) in our energy mix	%	96	97	97	>96	>96	Target met.	Long-Term Generation Expansion Plan.
Total GHG emissions / Net Operating Revenue	tCO_2e/(R$ thousand)	0.216	0.211	0.220	0.191	0.185	Target not met.	Sustainability 4.0 Program
Scope 1 GHG Emissions	Thousand tCO_2e	5,227	4,164	5,955	4,123	4,081	Target not met.	1% reduction per year between 2019 and 2023. Implement our Sustainability 4.0 Program and Energy Transition Project.

Disclosure	Unit of measure	Historical			Targets		Status in 2021	Targets for 2022 – Ongoing initiatives
		2019	2020	2021	2021	2022		
Scope 2 GHG Emissions (not including losses)	Thousand tCO_2e	8,579	3,788	8,103	3,750	3,713	Target not met.	1% reduction per year between 2019 and 2023. Implement our Sustainability 4.0 Program and Energy Transition Project.
Expand the sources included in Scope 3 GHG emissions	Scope	5	5	5	Add two new sources to the GHG emissions inventory by 2023.	Add two new sources to the GHG emissions inventory by 2023.	In progress.	Sustainability 4.0 Program
Total NOx emissions	(t/year)	8,769	7,411	12,825	24,821	24,821	Target met.	Sustainability 4.0 Program
Total SOx emissions	(t/year)	10,817	9,788	13,023	27,127	27,127	Target met.	Sustainability 4.0 Program
Total PM emissions	(t/year)	425	342	764	4,229	4,229	Target met.	Sustainability 4.0 Program
Fugitive SF_6 emissions	(tCO_2e)	34,941	45,320	29,300	157,371	157,371	Target met.	Sustainability 4.0 Program
Energy savings through PROCEL initiatives	Billion kWh/year	24.9	22.3	22.73	23.8	23.8	Target not met.	
Holding company GHG emissions	tCO_2	1,004	414.48	551.7	zero	zero	Target not met.	Sustainability 4.0 Program; Climate Change Mitigation and Environmental Protection Project; Energy Transition Project.

* The significant increase in Scope 3 emissions reflects electricity purchases by Eletrobras Amazonas GT from Independent Power Producers (IPPs) in the year, whereas no such purchases were made in 2019.

* In 2021 the Eletrobras Group's emissions intensity increased relative to 2020. This reflects the higher emissions as a result of an increased share of thermal power in the electricity mix, coupled with reduced hydroelectric generation by the Group amid the water crisis in the year.

Case studies

The Eletrobras Group has a steady pipeline of projects to reduce the environmental impacts from our operations, guided by our policies, programs and standards on climate change. On the following pages we provide case studies on some of these initiatives, divided into four categories: Opportunities, Studies, Action, and Innovation.

Opportunities

Furnas

In 2021 Furnas developed and launched a proprietary platform, called RECFY, to sell renewable energy certificates generated by its Mascarenhas de Moraes and Simplício/Anta (MG) hydroelectric dams. This innovative solution will help companies offset their scope 2 GHG emissions and minimize their environmental impacts.

Full traceability of the entire process—from electricity accounting to certificate sales—is provided using blockchain technology. The platform will also make the company more competitive by offering electricity that is both low-cost and certified. By implementing a platform that is managed in-house, Furnas saved 84% compared to what it would spend issuing I-REC certificates. RECFY also eliminates foreign-exchange risks, as no costs are charged in foreign currency.

Through the RECFY platform, Furnas is implementing new decarbonization solutions that build on the I-REC certification process for the Itumbiara and Serra da Mesa hydroelectric dams and the Fortim wind cluster.

Chesf

In 2021 Chesf completed I-REC certification, via the Totum Institute, for its Apolônio Sales, Boa Esperança, Funil, Luiz Gonzaga, Paulo Afonso (I, II, III and IV), Sobradinho and Xingó hydroelectric plants, and its Casa Nova wind farm cluster. This means that 98.7% of its installed capacity is now certified.

These new certificates are in addition to previous certifications for the Casa Nova II and Casa Nova III wind farms, obtained in 2020. By issuing I-RECs for its generation output, Chesf offset 100% of its scope 2 GHG emissions in 2021.

Studies

Chesf

Chesf continued to advance its Zero Account Program in the year, measuring the carbon footprint of eight small photovoltaic (solar) plants. These generation projects were estimated to have a carbon footprint of 42.5 gCO_2e/kWh, 78.4% lower than the average in the region.

Furnas

In 2021 Furnas completed a carbon footprint assessment of the Xavantes-Pirineus Transmission Line in Goiás. Total lifecycle emissions were estimated at 3,935 tCO_2e—61% from distribution and storage, 31% from production, and 8% from sourcing and pre-processing raw materials. The assessment also identified the main sources of GHG emissions throughout the value chain of the project, informing initiatives to effectively reduce these emissions.

CGT Eletrosul

In 2021 CGT Eletrosul conducted an assessment of current and future impacts from its Biguaçu-Blumenau and Itá-Salto Santiago transmission lines, located in respectively the coastal and western regions of Santa Catarina, each with its own climate and land features. The assessment was used to develop a matrix showing the transmission lines' most vulnerable structures and sections, helping to prioritize investment in ongoing and planned risk mitigation measures.

The project was implemented as part of the "Enhancing Climate Services for Infrastructure Investments (CSI)" initiative, a collaboration between Brazil, Costa Rica, Vietnam and African countries in the Nile River basin, with funding from the German International Cooperation Agency (GIZ). Throughout the project, employees were trained by Canadian engineers who are internationally recognized experts in assessing climate risks and impacts on infrastructure.

Action

Chesf

In 2018 Chesf launched a Net Zero Program to offset emissions from the electricity consumed by distribution utilities. Initial plans are to implement seven small photovoltaic power plants at the Pernambuco Solar Power Center of Excellence and at substations in Pernambuco, Alagoas, Ceará, Paraíba, Piauí and Rio Grande do Norte, with a total installed capacity of 4,800 kW. The project is scheduled to be completed in 2022.

Furnas

Furnas has set a target to reduce its fossil fuel consumption by 0.5% from 2022 to 2026, by switching its vehicle fleet from gasoline to ethanol.

Eletronorte

Eletronorte is currently upgrading equipment at its Aparecida thermal power station. This initiative is part of a project launched in 2011 to retrofit the power station from oil to natural gas. By replacing its first-generation PA turbines with PC models, Eletronorte has achieved a significant reduction in air emissions, including a 92% decrease in NOx emissions.

CGT Eletrosul

CGT Eletrosul is currently retrofitting more than 7,500 internal and external lights at its headquarters from fluorescent and sodium vapor to LED. The initiative supports the company's energy savings targets and is aligned with SDGs 7, 9 and 11. The project will generate estimated savings of approximately 440 MWh, or R$ 166,000 per year. It will also reduce peak demand by 10 kW.

The company has also migrated its headquarters and Sertão do Maruim operation in Santa Catarina from the Regulated Contracting Environment (ACR) to the Free Contracting Environment (ACL), allowing it to source its power supply from renewable sources.

The change will further support GHG emissions reductions. The entire electricity requirement, which was previously sourced from the National Grid, including from non-renewable sources, is now supplied from a small hydropower plant generating zero emissions.

Innovation

Eletronorte

Eletronorte has a long-standing commitment to the sustainable development of the Amazon. In 2021 the company partnered with the National Industrial Training Service (SENAI) to launch a public call for research, development, and innovation (R&D+I) projects aimed at developing photovoltaic and green hydrogen generation systems at the Balbina dam site.

The investment is being made as part of a newly created component of the company's Industry Innovation Platform, and should lead to promising partnerships to expand solar power in Brazil. The SENAI Institute for Renewable Energy Innovation will curate the project proposals and then assist in structuring Eletronorte's project pipeline.

Chesf

Chesf has developed a floating photovoltaic power plant on the Sobradinho dam reservoir as an industry-first project in Brazil that can be replicated at other dams to diversify energy sources. The system produces 1 MWp of supplementary generation capacity using solar panels mounted on platforms floating on the reservoir surface. In 2020 a project was approved to expand capacity to 2.5 MWp.

Chesf has also developed a 2,500 kWca small photovoltaic power plant at the Pernambuco Solar Power Research Center, as part of its initiatives to improve generation practices. In addition, Chesf is currently developing a demonstration concentrating solar power plant that uses parabolic trough technology to generate 0.8 MWe (net). The project includes research and development of solar thermal energy technology.

CGT Eletrosul

CGT Eletrosul established a collaboration with the Biochemical Engineering Laboratory at the Federal University of Rio Grande (FURG) to develop CO_2 biofixation technology for use at the Candiota power plant. Research has shown that every ton of CO_2 can generate half a ton of microalgae. This means that the carbon gas produced by the power station can generate approximately 146,000 metric tons of microalgae per month.

TCFD reporting status

Recommendation	Recommended disclosures	Page
Governance	a. Describe the board's oversight of climate-related risks and opportunities	
	b. Describe management's role in assessing and managing climate-related risks and opportunities	
Strategy	a. Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term	
	b. Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning	
	c. Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario	
Risk management	a. Describe the organization's processes for identifying and assessing climate-related risks	
	b. Describe the organization's processes for managing climate-related risks	
	c. Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management	
Metrics and targets	a. Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process	
	b. Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks	
	c. Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets	

Credits

Eletrobras – Centrais Elétricas Brasileiras S.A. provides several channels for communication with stakeholders.

For communications related to this report, please write to:
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