"THE TRUTH IS ALWAYS SOMETHING THAT IS TOLD, NOT SOMETHING THAT IS KNOWN. IF THERE WERE NO SPEAKING OR WRITING, THERE WOULD BE NO TRUTH ABOUT ANYTHING. THERE WOULD ONLY BE WHAT IS"[1]

Carbon emissions have been at the forefront of debates on environmental, social and governance matters, today conventionally called ESG. Eminent climate risks and a historical disdain for the issue demand agile and pragmatic discussions. Yet, regrettably, quick conclusions and overconfident opinions are repeated like catchphrases, followed by a dangerous hubris towards practical attitudes that are based on reductionist solutions. As the Cheshire Cat would tell Alice: "If you don't know where you are going, any road will get you there."

Despite its intrinsic complexity, the topic has been simplified around narratives. One-dimensional scenarios are built, primitive from an argumentative point of view and palatable to the common man. After all, interpreting facts through deterministic sequential processes is more pleasant than dealing with uncertainty and probability distributions. However, studies with small sample sizes, multiple ramifications and distant long-term impacts deserve careful treatment. When passing any kind of judgment, it is critical to leave room for doubt and remember that certainty is nonsensical. A skeptical approach while consuming narratives - questioning underlying assumptions - and analyzing raw data to form independent conclusions - is a trait of survivors. In this discussion around sustainability, we risk starting from global narratives without questioning the premises' adherence to local conditions.

In recent years, our investment in Eneva has been characterized as a villain-of-sorts in the portfolio due to its coal-fired power plants[2]. As a result, we decided to reassess from first principles and rely on quantitative analyses to broaden our capacity of reflecting on this controversial issue. This letter intends to share some of our findings.

Responsible for about 40% of the world's electricity generation in recent decades, coal has become an obvious enemy in the war against global warming. In December 2020, The Economist came out with a symbolic cover, "Making coal history," [3]indicating coal's new role in society: as a museum artifact. On this front, Germany has done an impressive job in transforming its energy matrix, reducing the standing of coal in electricity production from around 60% in 1985 to just under 30% in 2019, while the renewables' share jumped from 4% to 40% [4]in the same period. Their goal is to cut coal-powered generation to zero by 2038[5]. For that purpose, a program was designed based on supply security, social impact, and legal empowerment of generators with contracts still in force.

For Brazil, the share of coal is more relevant in ESG discussions than in the electricity matrix itself, accounting for less than 3% of the generated energy while renewables account for over 80% of the total: we currently have one of

[1] Susan Sontag

[2] The Itaqui and Pecém plants account for around 30% of the company's installed capacity in 2022. Once the projects under construction (Parnaiba V, Parnaíba VI, Azulão and Futura I) are concluded, this value falls to around 20%.

[3] The Economist, Making Coal History. December 3, 2020, (https://econ.st/3ujJm2o).

[4] This feat becomes even more impressive when accounting for Germany's renewable generation capacity factor. For 2021, the wind generation capacity factor was around 20% (18.5% onshore and 36% offshore) against 44.7% in Brazil, while in solar these figures were around 10% against 23%. In other words, the same wind and solar generation capacity in Germany would generate 2.4x more energy if installed in Brazil.

[5] Germany: Law on Phasing-Out Coal-Powered Energy by 2038 Enters into Force, Library of Congress. August 31, 2020 (https://bit.ly/germany_phasing_out_coal).

the cleanest electrical matrices in the world. Although coal means coal anywhere on the planet, the electricity it generates plays different roles in each energy system.

To explore our alternatives, let us briefly analyze the history and dynamics of the electricity sector in Brazil. The country's energy generation is heavily dependent on hydroelectric power plants and, therefore, on rainfall patterns. Thermal power plants play a role in supporting this source and are activated (or "dispatched", in the industry's jargon) when statistical models from the Brazilian National System Operator (ONS) indicate that the cost of generating the additional kWh in the thermal power plant, at the lowest available marginal cost, is lower than the estimated cost of using water from reservoirs to generate the same amount of energy[6]. Although Brazil's thermal park was hastily developed via emergency contracting through the federal Priority Program for Thermoelectricity (PPT) to avoid the dreaded blackouts in 2000-01, it plays an important role in energy security[7].

Unlike other countries whose thermal power plants are activated to balance energy production and consumption at all times, in Brazil this adjustment is historically performed by hydroelectric power plants. Here, thermoelectric power plants act as insurance during droughts, providing a complementary and continuous source of energy generation – an essential tool to deal with an unpredictable hydrological pattern and save water in reservoirs. Using a recent example, if the thermal power plants had not been activated in September 2020, by August of the following year we would have been left without a single drop of water in our reservoirs.

For the system to work seamlessly, agents should be prepared for a possible shortage of the natural resources on which our matrix depends. The planner (the Brazilian Energy Research Company - EPE) must guarantee the contracting of dispatchable capacity whenever necessary, while the operator (the Brazilian National System Operator – ONS) must dispatch energy from different sources, ensuring that the reservoirs can meet the demand in all future scenarios at the lowest possible cost. The tradeoff that naturally arises is between energy security and operational cost[8]. After all, what's the opportunity cost of not having any energy at all?

As the industry only analyzes costs incurred directly in its decision-making processes, the environmental angle seldom appears in the discussion. It is the most elementary example of externalities, like something covered in Econ 101. As far as energy generation is concerned, "environmental" is a very broad concept. The accessible and available metric for the test imposed by the climate agenda is the amount of greenhouse gases emitted for each unit of energy generated, where carbon is used as a reference to compare different gases in terms of global warming potential over a given time horizon[9].

The average emission of the Brazilian electricity sector in the last decade was approximately 100g of carbon equivalent (CO2e) for each kWh generated[10]. At this level of emissions, we could boast that our electrical matrix

[6] This applies in theory. In practice, the ONS can dispatch thermal power plants out of merit order, which indicates that the individual perceptions of those responsible for the operation of the system regarding energy needs and associated risks do not agree with the results obtained in the models used for programming the operation.

[7] Energy security has several dimensions; however, to sum it up, the International Energy Agency defines it as "the uninterrupted availability of energy sources at an affordable price".

[8] Costs incurred mainly in the purchase of fuels used for generating electricity.

[9] The most common window is 100 years (GWP100), used in both the Kyoto Protocol and the Paris Agreement. The definition of the baseline horizon for comparison is very relevant because of the Short-Life Climate Pollutants (SLCP) such as methane (CH^4), which, as a reference, has a 100-year GWP to the order of 25 times and a 20-year GWP to the order of 86 times. For a more in-depth discussion, see https://bit.ly/gwpdiscussion.

[10] Source: Ministry of Science, Technology, and Innovations. https://bit.ly/mctic_emissoes.

"substantially contributes to climate change mitigation", according to the European Union taxonomy for sustainable activities[11].

However, over the last 10 years Brazil has added risk to the equation: the system shifted from a predominantly hydroelectric base to a hydrothermal one with a significant share of renewable generation, reliant on production that is intermittent and uncontrollable[12]. There was also a change in water availability for energy production due to both the controversial effects of variations in rainfall patterns and the inadequate sectoral governance around the definition of the value of water and its multiple uses across different industries. As a result, the country has witnessed three water shortages in the last 10 years[13], with several negative implications for its economy, society and political institutions. Spot energy prices have oscillated aggressively, once reaching the extreme scenario where new thermal energy was contracted at R$ 1,560/MWh on an emergency basis - a typical recipe for destroying any governance structure capable of sustaining a complex and healthy system.

At the end of the day, unfortunately the reliability of the electricity sector is not guaranteed. Its energy is clean, but the matrix is fragile. Any emission-reducing effort invariably involves either a higher operating cost or greater risk tolerance. Brazil has been given the gift of nature, but we have not developed the necessary governance instruments for the industry to achieve stability. Without regulatory predictability and with weak governance, the country is held hostage to brisk decision-making. The perfect setting for the dreaded boogeymen to come out of hiding and prosper – at the expense of society.

"WITHOUT DATA YOU ARE JUST ANOTHER PERSON WITH AN OPINION"[14]

Owing to the intricate characteristics of the discussed system, we decided to design a quantitative study with PSR[15] that proposes to test certain hypotheses through robust stochastic optimization models[16].

We first analyzed the short-term impact of fully decommissioning Brazil's coal-fired thermal power plants[17] as of January 2022, assuming there were no replacements. In this scenario, thermal power plants would be shut down as of January 1st and no additional generating capacity would be installed to compensate them. The goal is to measure the value added to the system from the availability of these plants when energy-generating substitutes are unfeasible due to time-constraints. In a 4-year period between 2022 and 2025, CO2e emissions would decline by 34 million tons and the operating cost would increase by R$36 billion. This additional expenditure comprises direct costs related to the dispatch of more expensive thermal plants and theoretical costs associated with a higher energy

[11] An effort from the European Union to classify sustainable activities and redirect capital flows, promoting renewable investments with longer horizons and establishing "sustainability" as an explicit criterion in risk management. EU Technical Group on Sustainable Finance – Taxonomy: Final report of the Technical Expert Group on Sustainable Finance. https://bit.ly/eu_taxonomy.

[12] According to the ONS data, in 2006 the installed capacity consisted of hydroelectric plants (83%), and thermoelectric plants (17%). In 2021, the composition was hydroelectric (63%), thermoelectric (22%), wind (12%) and solar (3%).

[13] These happened in 2014, 2017 and 2020-21.

[14] W. Edwards Deming

[15] A prestigious consulting firm in the Brazilian electricity sector. Founded in 1987, it is a global provider of methodologies, analytical tools, and consulting studies for the energy sector. It has a team of 100 people and clients in 70 countries.

[16] PSR calculates the least-cost stochastic operating policy of a hydrothermal system, taking the following aspects into account: operational details of hydro and thermal plants, representation of "spot" markets and supply contracts, hydrological uncertainty, detailed transmission network, variation in demand by level and by system bus, and supply constraints. More information on https://bit.ly/psr_sddp.

[17] We simulated the decommissioning of the 7 coal plants considered by the ONS in the simulations of the Brazilian Monthly Operational Program (PMO), totaling 3 GW of installed capacity.

deficit risk. An initial analysis of these numbers estimates a cost of reducing emissions of US$192 per ton of CO2e, considerably above the highest emission prices (carbon tax) in the world[18].

In addition to the technical and theoretical aspects of such a decision, we haven't even started delving into issues related to the eventual governance necessary to balance this scenario. The indemnities alone, from both generators with operational authorizations still in force and energy contracts sold in exchange for availability within this regulated environment, would already constitute a considerable impediment[19]. All evidence indicates that full-scale decommissioning does not appear to be a desirable or feasible path.

Based on the implications of our analysis above, a commendable part of this debate is unfortunately influenced by the fragile line where we have decided to bound our argument. Given that the repercussions of climate impact are global, by definition, we should not limit the analysis to companies in which we invest in. Transferring control without decommissioning the assets is only a solution for corporate scorecards. Global temperatures do not care about companies' sustainability reports. BP's sale of oil fields in North Slope, Alaska, illustrates this point well[20]. After the sale, the company publicly boasted its 16% reduction of Scope 1 and 2 emission[21]. Yet, the real impact on the environment will be nil at best: Hilcorp, the company that acquired the asset, will continue to operate it and is not required to publish sustainability reports, effectively taking away public access to the region's emissions data.

In a world of checklists, the current structure is a resounding success: sustainability reports stand out as grandiose achievements, executives achieve their pre-set ESG goals and shareholders can elegantly show a successful path towards impact reduction in their portfolios. However, in the real world, oil continues to flow out of the ground. Only now it is not under society's supervision: the dirt did not go away, it was just swept under the rug.

The divestments of coal assets by Engie, a French energy multinational, are also worthy of reflection. The company's Brazilian subsidiary owned two coal power plants: the Jorge Lacerda Thermoelectric Complex (CTJL), in the state of Santa Catarina, and Pampa Sul Thermoelectric Power Plant, in the state of Rio Grande do Sul. The latter was made possible by the A-5 auction in November 2014, six years after the auctions in which Eneva contracted their own coal plants.

The Jorge Lacerda Thermoelectric Complex was developed in the 1960s as part of then-president Juscelino Kubitscheck's series of national economic reforms, the Plano de Metas, with the goal of solving a problem in the coal-producing region of Santa Catarina. The local ore was the only one with coking coal nationwide, but it was of low quality: its use in steelmaking was small relative to the role it played in steam production and high sulfur-emitting processes. Optimizing this process required the development of a coal complex comprising a thermoelectric plant, a steel mill, and an industrial chemical factory[22]. The thermoelectric plants were developed in a partnership between the state of Santa Catarina, the federal government and CSN (the 'National Steel Company', buyers of this metallurgical coal). This corporate structure kept changing in the decades that followed, until the plant ended up under Engie's control after Gerasul's privatization[23].

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[18] A relevant part of these additional expenses is related to the energy deficit cost used by the electricity sector, valued at R$6,500 in 2022. Adjusting to the reality of an expensive and effectively dispatched thermal plant, we estimated a cost of U$ 84/tCO_2e. This is in line with carbon prices in some European countries, but much higher than any carbon price potentially applied in Brazil. As a reference point, even with a clean matrix like ours, carbon prices at these levels would lead to a 10% increase in electricity bills.

[19] In Germany, around € 4 billion would be spent to reimburse investors who owned coal-fired power plants.

[20] https://bloom.bg/3iA6nc6

[21] Scope 1 emissions are a direct result of an agent's activities, such as the use of fossil fuels. Scope 2 emissions are the indirect result of one's activities – mostly its consumption but generated by another agent. Scope 3 emissions include all indirect emissions associated with the agent's activity, in addition to those included in Scope 2 – that is, all emissions in the value chain.

[22] Benefiting from sulfur in the production of acids.

[23] Gerasul was established in 1997 as a spin-off of the power generation assets of Eletrosul, a subsidiary of Eletrobras, and subsequently privatized in 1998.

The complex currently operates with an annual subsidy of approximately R$ 700 million, designated for the purchase of coal from Santa Catarina that is both heavily overpriced [24]and energy-inefficient, emitting around 4.3 million tons of CO2e annually - 27% more than what would be emitted to generate the same energy using imported coal. This cost is borne by all electricity consumers in the country through the Energy Development Account (CDE). That is the full picture here: a plant was created with cross-incentives, financed by the government, and then maintained through indirect taxes that were levied on the end consumer.

Undeniably, coal mining and power generation are relevant to the region's economy, which should not be disregarded in a country with an electrical matrix that is already considerably clean. Circling back to our initial comments on the German coal transition plan, the program projects around € 14 billion in financial assistance until 2038 for their mining-dependent regions. Another € 26 billion could be invested in research, infrastructure or the establishment of federal institutions in these areas. However, in this ESG alphabet soup, comparing 'E' with 'S' must be done with due attention to 'G'. Any kind of cross-benefit must be valued, discussed, and compared with other alternatives. How many GDP units were gained per million tons of CO2e emitted in Santa Catarina? How does this compare to other options available to Brazil? Groups with greater political capital tend to prevail in defense of their own interests, leading to a scenario that Paulo Pedrosa, former executive secretary of the Ministry of Mines and Energy, described as "local good in exchange for distributed harm". Until we have developed a properly defined framework to support decisions of this nature, we will always be at risk of becoming hostages to articulate lobbyists, skilled at gaming the nuances and loopholes that permeate our peculiar sociopolitical system.

The Jorge Lacerda Complex was eventually sold to a financial agent and, after Law nº 14,299/2022 was approved in January 2022, should generate consumer-subsidized energy until at least 2040[25] [26]. The second plant, Pampa Sul, is currently for sale along with an expansion project and licenses allowing it to double its capacity. On Engie's balance sheet, a thermal power plant disappears. In the real world, another one appears right next to it. The company claims it is "committed to accelerating the transition to a carbon neutral world", yet risks falling into the trap of only optimizing for metrics included in its sustainability report. The Brazilian subsidiary of Portuguese state-owned EDP, which shares a coal-fired thermal complex with Eneva in the northeastern port of Pecém, is another emblematic case of environmental cognitive dissonance: the solution put forward to address its "problem" of coal exposure is to deconsolidate the asset.

It's hard to blame the executives when the incentives in place are grounded in a simplistic view of an extremely complex multivariate process. If it does not appear in financial statements, the problem has been solved[27]. Out of sight, out of mind.

"SHOW ME THE INCENTIVES AND I WILL SHOW YOU THE OUTCOME" [28] OR "DON'T HATE THE PLAYER, HATE THE GAME"

[24] Coal from Santa Catarina is 4 times more expensive than the one extracted in its neighboring state of Rio Grande of Sul: R$ 338/ton versus R$ 87/ton, according to the "Report on Coal Thermoelectric Generation and Coal Mining Activities", published on July 2021 *(https://bit.ly/relatorio_gt_carvao)*.

[25] Engie's announcement detailing CLTJ's sale: https://bit.ly/engie_frCTJL

[26] The Law creates the Fair Energy Transition (TEJ) program, guaranteeing the contracting of energy from the CTJL to maintain the amount of coal purchased at current levels. Although the concept of a fair energy transition makes sense, designing a program focused only on Santa Catarina's coal region does not seem to be the right path.

[27] EDP was ranked first in the B3 Corporate Sustainability Index in 2021 (https://bit.ly/edp_ise).

[28] Charlie Munger

Eneva's thermal plants receive fixed monthly payments in return for their guaranteed availability to the system, generating energy when requested by the ONS. For each kWh generated, Eneva receives an additional payment to cover its marginal production costs, the so-called CVU (Variable Unit Cost). Although these plants have been granted authorization to supply energy until 2042-43 from the relevant authorities, the contracts that fund them expire in 2026-27. The company therefore has a significant decision to make in the coming years regarding the future of these thermal plants. Here we are faced with the eternal conflict between what is ideal and what is feasible.

In a purely rational world, where there are neither lobbyists and trade associations nor conflicts of interest and corporatism, our system would already be well-positioned to be entirely renewable - comprising only solar, wind and hydro plants. Under this scenario, thermal power plants would both become less relevant and run on natural gas, the cleanest fossil fuel out there. Eneva would be able to retire its coal-fired thermal plants without putting the system's stability at risk.

Tony Seba, from think tank RethinkX, forecasts that by 2030, systems made up of renewables and batteries will be more attractive than the alternatives from a financial standpoint – even without accounting for carbon emission costs[29]. The basis for his argument lies in the non-linear trajectory of technological disruptions and their impact on the price of lithium-ion batteries, and on photovoltaic and wind power generation assets. While the price of batteries has dropped by almost 90% in the last decade, it is projected to decline a further 80% over the next 10 years - with wind and photovoltaic energy following suit.

Due to the variable and uncontrollable nature of renewable resources, a system that is entirely dependent on renewable energy needs redundancy to function. In times of lower resource availability, the energy generation capacity must be sufficient to absorb these exogenous shocks and supply projected demand with some slack. This implies that, at any point in time, the system will be able to generate considerably more energy than it is capable of consuming at a marginal cost close to zero. Abundant, clean and free energy, available to help in reducing emissions in other sectors of the economy, is a fundamental element in our journey towards "net zero". The International Energy Agency (IEA) forecasts that electricity, which today makes up about 20% of all global energy consumption, is expected to account for around 50% in the coming years[30]. The energy transition will demand a lot of power. The cheaper and cleaner it is, the better prepared it will be to achieve the expected results in a technically feasible, efficient, and socially acceptable way.

Although Tony Seba's provocation is interesting enough for generic cases, when applied to Brazil it becomes even more so. We have been blessed with water resources that feed reservoirs capable of storing about 35% of our annual demand[31]. To store the same amount of energy in lithium-ion batteries, we would need to buy 100% of all current global production capacity for the next 300 years. If we opted for Tesla megapacks, this storage capacity would come at a cost of 68 trillion dollars[32].

With an estimated investment of R$ 300 billion, we could increase the installed renewable generation capacity by approximately 90 GW and use the hydroelectric reservoirs for load modulation[33]. However, it would be necessary to pay attention to the electricity market's framework and design. With marginal costs approaching zero, incentives must be designed to preserve the profitability of investments in generation capacity. Given the increasing volatility

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[29] https://bit.ly/tony_seba

[30] IEA's "Net Zero by 2050: A Roadmap for the Global Energy industry" (https://bit.ly/net_zero_2050).

[31] According to ONS data, the demand in 2021 was 556 TWh, while the storage capacity of the reservoirs is 212 TWh.

[32] https://bit.ly/tesla_megapack

[33] In this overly simplified and internally built exercise, we optimized a matrix, on an hourly basis, composed entirely of existing hydroelectric plants combined with wind and photovoltaic plants. For this system to work smoothly, it requires hydrological resources equivalent to only 50% of the Long-Term Average (MLT). With 80% MLT, we would be able to generate an additional 11 GWMed (17% of demand) at zero marginal cost. In addition, non-dispatchable thermal plants such as nuclear, biomass and industrial waste would act as an extra buffer, reducing the investment needed to balance this system.

of energy prices, mechanisms and markets that enable agents to properly manage risks must exist. Such a scenario is technically possible, but politically unlikely. It is easier to predict the behavior of photons inside a solar panel than how congressmen will vote.

Public Consultation nº 33 of the Brazilian Ministry of Mines and Energy (MME), carried out in 2017 during the admirable management of the electricity sector under President Temer's administration, symbolizes the difficulty of implementing complex technical changes in a political environment[34]. It was the first sectoral reform proposal to undergo an open public debate, doing away with the history of reforms imposed by provisional measures that were outcomes of discussions in restricted and obscure circles. At the end of the process, the "Bill for Modernization and Opening of the Electric Energy Free Market" was presented with eight technical notes justifying the choices that were adopted and detailing the changes implemented during the public consultation process. The bill, which modifies 12 different laws throughout its 10 articles, has not yet been voted on. Congress has found no time to analyze it among its other priorities.

Law No. 14.182/2021, which provides for the privatization of Eletrobras, is another interesting document to illustrate the dynamics of the Brazilian national congress. It stemmed from Provisional Measure nº 1.031/2021, created by the MME during Bolsonaro's tenure with the aim of privatizing Eletrobras in a similar model to the one proposed in Bill nº 9.463/2018, a legacy from the previous administration. The Brazilian president personally delivered the Bill to Congress, demonstrating his commitment to the liberal agenda shortly after the intervention that led to Roberto Castelo Branco's resignation as Petrobras' CEO.

The measure received almost 600 amendments from 65 different congresspeople and left the chamber disfigured, incorporating technical decisions without first allowing for the appropriate discussion forums, exceeding the expected competencies of a legislative body. Three different themes, unrelated to the bill's original content, were condensed into a mega-paragraph of almost 4,000 characters also featuring Eletrobras' privatization. A quintessential legislative technique to protect the bill from Executive vetoes, in an environment of low institutional trust between the powers. The so-called "jabutis"[35] distort the dynamics of energy contracting, extending terms in old contracts with unrealistic prices and creating market reserves without technical justification. Finally, they require the contracting of 8 GW in natural-gas power plants, geared towards selected regions that will incur the need to build gas pipelines for fuel supply. What should have been the outcome of interactions between regulator, planner, and the market in an organically adaptive process, instead arose from the stroke of a pen focused on advancing the agenda of specific interest groups. Another classic example of local good at the expense of distributed harm.

These thermal power plants would probably not be contracted in a market process because of their high cost and level of inflexibility, which limits ONS' performance. Even more so if we consider that the Brazilian electricity sector is expected to add an unprecedented amount of renewable energy generation projects in the next years.

The 2031 Ten-Year Energy Expansion Plan, produced by EPE, indicates that renewables will account for two-thirds of all generation capacity added in the next decade[36]. In this forecast, wind and centralized solar sources will add about 17 GW by 2031 and account for 40 GW of aggregate capacity, or 20% of the total system. However, the study apparently underestimates the industry's progress in the coming years. There are 46 GW of concessions issued for new projects, of which 9 GW are already under construction[37]. These figures do not include distributed solar

[34] https://bit.ly/pc33temer

[35] Political jargon in Brazil, referring to clauses that are slyly added to bills by self-serving congressmen, despite having nothing to do with the original text. Particularly common with bills that have strict deadlines so that the time constraints can be used as leverage.

[36] https://bit.ly/pde_2031

[37] MP 998/20, converted into Law No. 14,120/21, limited the benefit of a 50% reduction in transmission and distribution tariffs, granted by Law No. nº 13.360/16, for projects that requested delivery until March 2022 and went into operation up to 48 months after the request. Naturally, this measure created a kind of gold rush for the development of renewable projects, especially for photovoltaic

generation projects, which already represent almost 10 GW of installed capacity and will add between 20 and 40 GW of new capacity to the system within the next decade, according to EPE.

With the massive incorporation of new renewable capacity, the system should become less dependent on thermal power plants. This translates into an equilibrium in which the benefit of new gas projects, both in terms of CVU and CO2 emissions, may not be sufficient to remunerate the capital employed in the venture from a purely energy-supply standpoint. The value of these assets, if any, will be associated with other dimensions of energy security: state-of-the-art supply, operational flexibility or even robustness to tail risks.

In the joint study with PSR, a second exercise was conducted to evaluate expansion alternatives for the eventual replacement of coal plants at the end of their contracts in 2026/2027 [38] under different pricing scenarios for greenhouse gas emissions. That is, assuming the status quo remains unchanged, the operation of coal-fired thermoelectric power plants continues to be economically attractive. But what carbon price would be necessary to make the decommissioning of these plants attractive, from a financial point of view[39]? The results indicate a breakeven emission price of at least 250 to 300 R$/tCO2e - well above the range deemed acceptable in Brazil, which is lower than R$ 45/tCO2e[40].

The most appropriate path forward for the system would be to keep the well-operated and fully amortized assets, such as the imported coal power plants, inactive yet sufficiently well-maintained to generate energy at the most critical moments of operation. Instead of pressuring good companies to sell their coal assets, we should do the opposite: pressure them to keep them, guaranteeing a functional safety net in case the system wanes. After all, how much is energy worth when unavailable?

"THERE ARE STILL PEOPLE WAITING TO TELL ME. THE NEWS THAT I CAN'T HEAR ANY MORE. I KNOW, THERE ARE ALSO PEOPLE DECEIVING ME. OH, WHAT NONSENSE, IT'S TIME TO GROW UP"[41]

External costs or benefits are hardly accounted for when we are driven by incentives centered on box-ticking rather than truth-seeking. Eneva's integrated Azulão-Jaguatirica project is an interesting example of the damaging effects from such a myopic analysis. To date, the state of Roraima is the only one in the country that has not been connected to the National Interconnected System (SIN). Disputes in the licensing of the Manaus-Boa Vista transmission line, proposed back in 2011, have stalled construction. As a result, the region's energy is imported from Venezuela and generated in local thermal plants – fueled by diesel and subsidized by SIN consumers. Due to the Venezuelan crisis and the ensuing reduction in energy availability, the state is now fully supplied by thermoelectric power plants at an annualized cost of approximately R$ 2 billion in subsidies, over 3 times the state's revenue from electric bills. To

projects - reminding that that ANEEL Normative Resolution No. 876, of March 10, 2020, does not require the deposit of performance bonds in this case.

[38] Again, using the stochastic optimization models developed by PSR. This time, different alternatives were evaluated for the expansion of the SIN by 2040. Among the alternatives – comprising different sources of energy generation, expansion of interconnections and even the addition of batteries – was the possibility of rehiring these coal-fired power plants at a cost equivalent to 40% (the same value used by EPE in its studies of the 2030 Ten-Year Plan of Expansion) of the investment in a new plant (currently estimated between R$ 7 and 9 million per installed MW).

[39] Not from the point of view of the asset's owner, but systemically: this is the inflection point where the system's expected expansion and operating costs, within this timeframe, are lowered by *not* rehiring these thermoelectric plants (versus hiring them).

[40] For example, in the PMR Project developed by the Ministry of Economy in partnership with the World Bank to study the pricing of emissions in Brazil, the indicative range varied between 20 to 45 R$/$tCO_2e$.

[41] Excerpt from Brazilian song "20 e Poucos Anos" by Fabio Jr.

create an alternative to the Manaus-Boa Vista line, ANEEL and CCEE held the Generation Auction 01/2019 to supply Boa Vista and surroundings regions. In this auction, Eneva developed an innovative project that involved the extraction and liquefaction of natural gas in the Azulão field in Silves in the state of Amazonas, transport of LNG in cryogenic trucks for more than 1000 km to Roraima and, finally, regasification and generation of energy in Jaguatirica II power plant. Although this ingenious project translates into a reduction of 244,000 tons of CO2e per year, Eneva's sustainability report will only allude to an increase of 435,000 tons since the 679,000 tons of carbon avoided in diesel oil generation will not appear anywhere. In this case, the excessive focus on building a comfortable public image would have given rise to misguided incentives, risking the conception of this innovative solution. This would ultimately be detrimental for consumers in Roraima, Eneva's shareholders and the environment.

After attempting to justify our investment in Eneva, please allow us a moment to reflect on the strength of narratives and their ability to sway the discussion. The Brazilian electricity sector emitted on average 56 million tons of CO2e per year between 2016 and 2020[42], around 2.8% of our total emissions[43]. A reasonable environmental cost for an industry that not only accounts for the basic infrastructure necessary to enable the entire country's economic activity, but is also directly responsible for tens of billions of reais in direct investment. The largest share of Brazil's greenhouse gas emissions comes from the so-called "Land and Forests Use Changes" - in other words, deforestation. In the last five years, an average of 850 million tons of CO2e were emitted per year as a direct consequence of deforestation, 15 times more than the electricity sector all the while not creating any relevant economic value for the country: an activity only made possible by the successful pressure from groups with extractive economic interests and political support.

There appears to be an excessive focus on less material issues that overlook the questions that can, in fact, be transformative in our ambition to build a legacy of climate sustainability coupled with economic growth. Germany promotes green hydrogen because the companies that benefit most from its mass adoption are German[44]. The United States promotes carbon capture and storage, a way of bolstering its national infrastructure centered on the use of fossil fuels. What does Brazil promote? We need to build our own narrative and the Amazon should undoubtedly take center stage on this journey.

Philosopher Simone Weil says that attention is the purest form of generosity. Deforestation figures and the path of the ESG discussion in Brazil show a clear imbalance in how our attention is distributed. We are sitting on the greatest biodiversity reserve in the world. We have the largest amount of carbon in organic matter on the planet, as João Moreira Salles reminds us in the unmissable series of articles Arrabalde[45], about the Amazon for Revista Piauí.

In a world destined to face this looming climate emergency, the rainforest seems to be the only possible way for Brazil to reach global relevance. This battle between narratives, ignited by an ideological polarization, has been wasting time that the country does not have to spare. Reality has already knocked on our door: climate change denial and environmental radicalism, on opposing sides of the spectrum, delay and paralyze attitudes that can transform apparent costs into positive levers. We need to overcome the prophecy that has unfortunately been fulfilled so far: Brazil never misses an opportunity to miss opportunities.

[42] Statistical Yearbook of Electric Energy 2021, EPE (https://bit.ly/anuario_epe_2020).
[43] SEEG Platform (Greenhouse Gas Emissions Estimation System), an initiative of the Climate Observatory.
[44] Siemens and Thyssenkrupp are the largest global producers of the electrolyzers responsible for green hydrogen production.
[45] https://bit.ly/arrabalde