PONTIFÍCIA UNIVERSIDADE CATÓLICA DO RIO DE JANEIRO

DEPARTAMENTO DE ECONOMIA

MONOGRAFIA DE FINAL DE CURSO

THE INCREASE IN THE SHARE OF WIND ENERGY IN THE BRAZILIAN ELECTRICAL MATRIX AND THE IMPACT ON THE INTRINSIC VALUE OF AERIS ENERGIA

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Rio de Janeiro, dezembro de 2022

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"Declaro que o presente trabalho é de minha autoria e que não recorri para realizá-lo, a nenhuma forma de ajuda externa, exceto quando autorizado pelo professor tutor".

Bernardo Afonso Soares

"As opiniões expressas neste trabalho são de responsabilidade única e exclusiva do autor".

Acknowledgements

First of all, I would like to thank my parents for giving me the opportunity to study at one of the best educational institutions in the whole country, and for always supporting and demanding that I perform at my best. Without them, I wouldn´t be able to leave this university with this amount of knowledge that I acquired during this period.

I would like to acknowledge my advisor Maria de Nazareth for supporting me during this work and for all the classes that I had with her during this period I was in the university. Her classes covered topics of great interest to me and undoubtedly contributed to my education and to the skills that I apply in my job.

Besides, I would also like to praise my girlfriend for being with me during important moments from this trajectory in the university and during my work. She always supported me in every decision and encouraged me to move on.

Finally, I want to thank the Liga de Mercado Financeiro PUC-RIO for providing me great knowledge beyond what I learned in the university and which I apply daily in my work. This institution provided me great friends and contacts that I will carry on with me during my whole life.

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1. Introduction

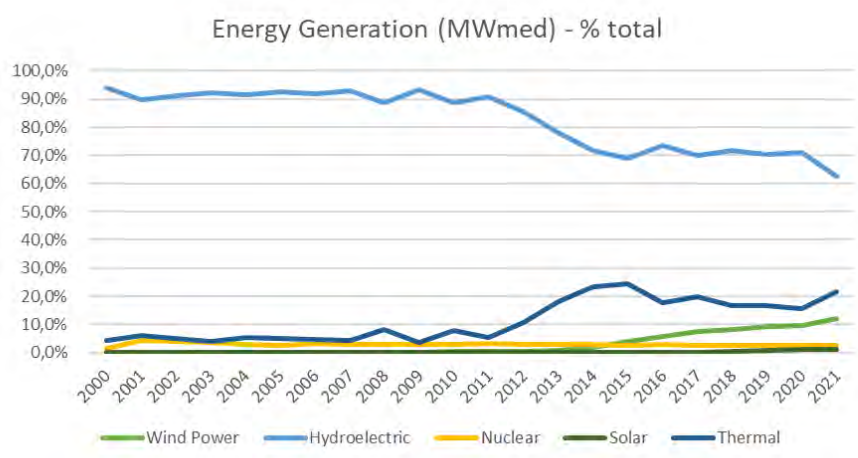
The Brazilian electrical matrix was historically based on the dependence of two main sources: the hydroelectric, which is the predominant fount, due to the large availability and volume of water in the country´s rivers; and the thermoelectric, whose majority of the plants operates only in times of low production from hydroelectric plants, given that it is a more expensive and a more polluting source. In 2021, the hydroelectric source represented 65,2% of the total electricity produced in Brazil. Even though the hydroelectric source is renewable and cheap, the country´s dependence on this source caused Brazil to suffer periods of energy rationing, as a result from low rates of rainfall.

The most severe event of energy rationing in Brazil occurred in July 2001, denominated "blackout crisis". At that time, 89,6% of the Brazilian energy was coming from the hydraulics (Felix, 2021). With the rain shortages which occurred throughout 2001, the water level in the reservoirs of Brazilian hydroelectric plants dropped significantly. At that point, serious rationing measures were taken, with hypothesis that might have become necessary to make long forced cuts, or even blackouts. This event resulted in big losses for the Brazilian economy, and slowed down its GDP´s growth to 1,42% in 2021, against a pace of 4,50% in 2000.

As o result of this serious event, the Brazilian government, became aware of the importance of taking measures to mitigate this risk of rainfall dependence. The Energy Reallocation Mechanism (MRE) was created precisely to minimize the individual risk of physical production from the hydroelectric plants, transferring the surplus from those who managed to produce more than their physical guarantees to those who spawned below. Thus, if a power plant that is participating in the mechanism suffers with low levels of water in the reservoir, due to rain shortages in the region that the plant is located, the production deficit would be compensated by another plant production surplus, sharing the geological and hydrological risk. The National Interconnected System (SIN) is a wide network of plant installations and transmission networks and is responsible to promote this energy transportation across the entire country, turning the MRE mechanism practicable. From an economic point of view, the mechanism aims to minimize short-term price volatility and the exposure of the agents to the hydrological risk and energy supply risk.

Since an energy crisis generates consequences such as the deterioration of the country´s economy, due to higher inflation caused by higher short-term energy tariffs, as well as reduced energy supply, there was a growing perception of the need to diversify the electrical sources in the Brazilian matrix. Therefore, after the 2001 rationing crisis, other electrical sources of energy grew significantly, concurrently to the number of solar, biomass and wind power plants. One of the founts that gained a lot of prominence was the wind power source, as a result from the large availability of winds, especially in the northeast and south region from the country. In 2021, Brazil delivered a record in wind power energy generation, which came to represent 11.11% of the Brazilian electrical matrix, totaling 20.1 GW of installed power from this source (Machado,2021). In the chart below, prepared with ONS energy generation data (MW), it is possible to observe the growth of the wind energy share in the Brazilian electrical matrix, without considering the biomass source:

Figure 1: Energy Generation by Source



Thus, two question arises:

1. Which companies are benefiting from this strong and fast growth from the wind energy industry?
2. Is the intrinsic value growth over time from the companies operating in this sector just a reflection of the growth in this industry? Will the growth from these companies financial results slow down when the industry growth reduces?

In order to evaluate those questions, and possibly identify an investment opportunity, this essay will make an analysis from Aeris Energia, a Brazilian company that manufactures wind blades to wind turbines. In the end of 2020, the company made its Initial Public Offering (IPO) in the Brazilian stock exchange, taking the attention from investors to the wind energy generation industry in Brazil. The company is managing to strongly increase its revenues and its wind blade manufacturing contracts, despite the impact from the pandemic in the raw material prices used in the production chain, as well as in the demand. Besides, this essay aims to evaluate the impact from the increase of the wind power energy source share in the Brazilian electrical matrix in the intrinsic value of Aeris Energia, arguing which other variables such as competitive advantages, high quality management and internal efficiency can also sustain the company´s growth.

2 – Literature Review and Methodology

In order to analyze the impact from the increase in the share of wind energy generation in the Brazilian electrical matrix and the impact in Aeris Energia intrinsic value, this essay will resort to econometric, accounting and finance methods. Furthermore, a company should be evaluated not only by quantitative methods, but also by qualitative aspects of the business. That includes an industry review, a deep understanding of the company business model, in addition to the main competitors, its relationship with suppliers and clients, and many other aspects that influence the normal course of a company.

There are several studies evaluating the social and environmental impacts from the increase in the share of wind power energy source in Brazil. Nonetheless, there is a lack of works that assess the impact from this growth in the wind generation industry and which evaluates the impact in companies operating in this industry. Therefore, in order to elaborate this study, qualitative and quantitative methods will be used.

2.1 – Qualitative Methods: Business, Sector and Competitive Landscape

When doing an analysis from any company, it is essential a deep qualitative understanding of its business operations. In the book "Fora da Curva 2", which brings together the stories of great names in the Brazilian financial market, Marcio Appel points out the need for a company to be in in a good industry which has positive trends for the future, otherwise the chance of the business not prospering is very high. And when it is referring to the industry, he includes the understanding of the competitive landscape of the company and its competitive advantages, as well as the macroeconomic scenario.

Besides, the recent ESG trend, in which companies with good social, environmental and governance metrics performed better from the point of view of value generation, is a proof of the need to understand the industry and situation in which the company is situated. Firms that have negative ESG practices are suffering from credibility loss, a growing perception of risk, and consequently, the deterioration of its value.

Thus, beyond the studies of all materials made available by the company, such as the reference form, quarterly information, calls with investors, and other studies, there are some methods that will be used as a guide to the qualitative analysis. Those are: Macroeconomics understanding, industry landscape, SWOT Analysis and Porter´s five forces.

The first one, I will understand the evolution of the wind power generation industry in Brazil, and the increase in its share in the Brazilian electrical matrix, which were the drivers from this growth, and how the actual macroeconomic scenario is affecting Aeris Energia operations.

A SWOT analysis seeks to understand how the company's features configure its strengths, weaknesses, and allow it to take advantage of market opportunities, whereas it is exposed to certain threats (Queensland Government, 2021).

- **Strengths:** When analyzing the company´s strengths, it is necessary to understand how the company aggregates value to its clients, and which features make more advantageous for its clients to contract the company´s services.
- **Weaknesses:** By the weaknesses, we analyze which aspects the company should improve to aggregate value to its business and to have advantages to its peers. At this point, it must be understood which features makes clients lose utility when using the company's service.
- **Opportunities:** Now in an externally part of the process, we understand how the company can benefit from positive trends in the environment, and how the opportunities can generate value for Aeris Energia.
- **Threats:** Another external aspect are the threats in which the company are exposed, that must dialogue with the competitive environment and industry trends in which the company is situated. Those aspects can harm the company´s business.

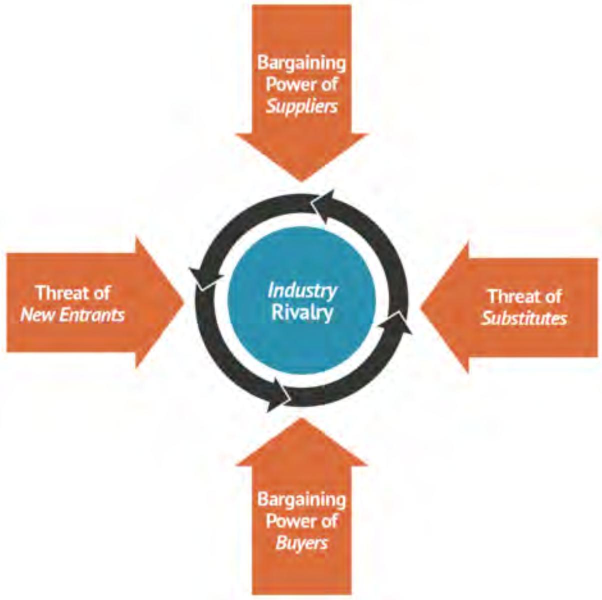
The following image summarizes the aspects of a SWOT analysis:

Figure 2: Swot Analysis

The Porter´s five forces method will be useful to analyze the Aeris Energia´s competitive scenario and the competitive advantages of the company in this fast-growing sector. Michael Porter defines, in 1980, the five forces that helps to explain why different industries can sustain different levels of profitability, and allows to measure the competition intensity (Scott, 2020). The five forces are:

- **Competition of the industry:** Refers to the number of competitors and their ability to undercut a company.
- **Potential of new entrants into the industry:** The company power of a company is affected by new entrants in the market**.** An industry with strong barriers to entry is ideal for the companies in that industry**.**
- **Power of Suppliers:** Refers to how easily supplier can increase the costs of inputs. It is necessary the understanding of the bargaining power of the company´s direct suppliers.
- **Power of customers:** Related to the bargaining power of direct customers, and how easily they can negotiate contracts and prices with the service company.
- **Threat of substitute products:** Substitutes goods and services which can be used in place of the company´s goods or services can pose a threat. It is important to analyze how easy those services can be substituted.

Figure 3: Porter Forces



Porter five forces

2.2 – Quantitative Methods: Econometrics, Analysis of Financial Statements and Valuation

2.2.1 - Econometrics

In this study, we will make regressions of the evolution and increase in the energy generated by wind sources, with operational metrics from Aeris Energia, such as the equivalent production in MWaverage resulting from the wind blades manufactured by Aeris Energia installed in wind turbines. This data will be taken from the Aeris Energia investor relations website and from ONS. The idea behind those regressions it is to assess how much of this company´s growth is due to the growth of the sector. Thus, controls such as the evolution of Aeris Energia market share, the number of competitors, the evolution of the total energy generation in brazilian electrical matrix, and the total demand for electrical energy should be included in the regressions. Those controls are important to a more reliable estimation of the impact of this increase in the share of wind energy generation in Aeris Energia´s business, since those variables are drivers that impact Aeris operations.

The econometric methods are procedures which we can estimate the relationship between variables, potentially identifying a causality or relationship between them. The methods that will be used to estimate those regressions are:

- **Ordinary least squares (OLS):** This method allows to estimate the relationship between variables in a linear regression model. The OLS relies on minimizing the sum of squared residuals between the actual and predicted values, that are the residuals of the equation (u_i) (Kumar, 2022). The idea behind this method is to minimize the error, that is the distance between the linear relationship, when a scatter plot is traced. We can see that dynamic in the graphic below:

Figure 4: Ordinary Least Squares (OLS)

The formula for the OLS method is

$$Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + u_i$$

In which Yi is the dependent variable and X_i are the independent variables. By estimating this model, it is possible to estimate the parameters (β) of the equations, to evaluate the relationship. It will be used multiple linear regressions.

In order to make those regression models, and to treat the data basis that I will acquire, I will make use of the R Studio software, that is an appropriate software to developing econometric models.

2.2.2 – Analysis of Financial Statements

The financial statements of the company allows the investor to make an analysis of the specific company, by understanding its operational efficiency, its ability to generate cash flows, its financial leverage, that are drivers of value for a company. The most used financial statements, that are going to be explored in this paper, are the Balance Sheet (BS), the Income Statement (IS) and the Cash Flow Statement (CFS).

- **Balance Sheet:** The Balance Sheet is a company financial statement that reflects the financial position of a company in a specific point in time. In the balance sheet, we can find all the company assets, that are classificated as current and non-current assets, and in the right side of the BS (Balance Sheet) we can find the sources that finance those assets, that are either Liabilities (Divided in current and long term) or Equity.
- **Income Statement:** The Income Statement is a financial statement that reflects the company performance during a specific period. This statement presents all the company´s sources of revenue, and all sources of expenses, getting into the net profit. Besides, the Income Statement presents the accrual method of accounting, in which revenues and expenses are recorded when they are incurred, regardless of when the money is actually received or pay. The basic Income Statement formula is:

  Revenues – Expenses = Net profit.

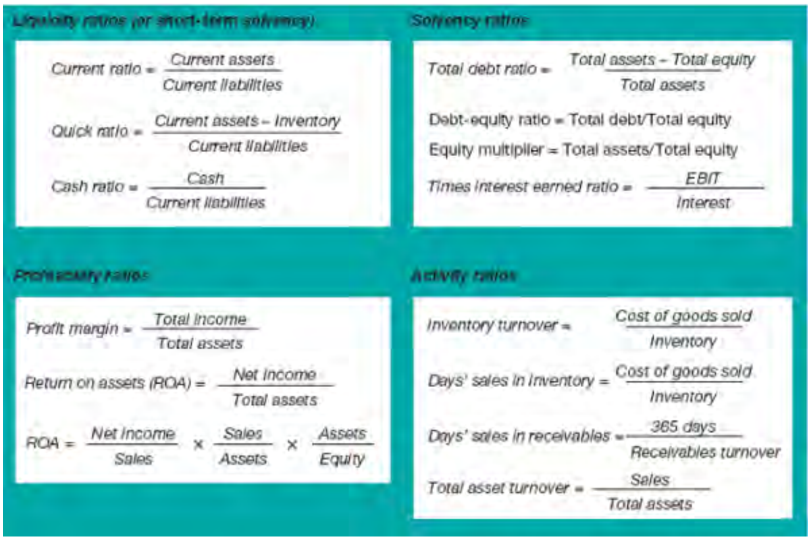
- **Cash Flow Statement:** The Cash Flow Statement is a statement that reflects all the cash inflows and cash outflows that occurred during a specific period. Whereas the income statement follows the accrual method of accounting, in which revenues are recorded when they are incurred, the cash flow statement follows the cash method of accounting, in which records only when cashes comes in or out. The Cash Flow Statement is divided into three categories: Operating Cash Flows, Investing Cash flows and Financial Cash Flows.

In order to analyze Aeris Energia financial statements, three methods can be used, in a complementary way: The **horizontal analysis or cross-sectional** analysis, in which is assessed the company performance itself across time or against peers, comparing the growth of its financials; The **vertical analysis** seeks to understand how the accounts relate within a period, by calculating its margins, and **ratio analysis**, that are useful to evaluate specific purposes in a company, by comparing the relationship between the accounts.

Combining all those methods, we can classify the company ratios as: **liquidity ratios,** that indicates the capacity of the company to deal with its short term liabilities; **solvency ratios**, which indicates the company ability to meet its long-term obligations, as well as the company´s financial health; **activity ratios,** that analyses the company´s turnover and operational efficiency; **profitability ratios**, that evaluates the company ability to generate returns to its shareholders; **valuation ratios**, which shows the relationship between market value and some fundamental metric (Carlson, 2019).

Some ratios that will be used in the analysis are:

Figure 5: Financial Ratios



The current and quick ratio, for example, demonstrates the company´s ability to meet its short-term obligations, by using the resources in the current assets to deal with the current liabilities. The quick ratio excludes inventory, that are fewer liquid assets, to have a better picture of its short-term liquidity.

The debt-to-equity ratio, is a great indicator to evaluate a company´s leverage, and if a company will be able to meet its long-term obligations.

In order to do a vertical analysis, the calculation of profit margins is indispensable. Gross Margin is calculated as the gross profit divided by net revenues and indicates the company ability to deal with its direct costs. The EBITDA (Earnings before interest, taxes, depreciation and amortization) Margin, calculated as EBITDA divided by net revenues, indicates the level of operational efficiency of a company, since EBITDA it is what remains after deducting all the operating costs of the company.

Inventory turnover, calculated by COGS (Cost of Goods Sold) divided by the Inventory in the BS, indicates the level of efficiency in which the company deals with its inventory and points out whether inventories become obsolete or are in constant turnover. However, a very high inventory turnover may appear that the company is liquidating its inventories at any cost.

The ratios, combined with the vertical and horizontal analysis, allows to determine the operational and financial features of a company. Therefore, it is possible to obtain deeper analysis of a business, as well as comparing with its competitors.

2.2.3 – Valuation

Valuation is the quantitative calculation of the intrinsic value of a company. There are many ways of valuing a company. For instance, it is possible to value a company by using valuation multiples, by comparing with the ratios from competitors. Commonly used multiples to value a company are EV (Enterprise Value)/EBITDA and P/E (Price to earnings).

One of the most accepted methods in the corporate finance discipline, to value a company, is the discounted cash flow method (DCF), which consider that the intrinsic value of a company are the future forecasted cash flows discounted to the present by a rate that capture the risk from the business/investment.

The Discounted Cash Flow model is a great method to value slightly more mature companies, where future cash flows become a little more predictable. In addition, it is also a more suitable method for valuing companies that do not have a high base of intangibles on their balance sheet. Nevertheless, the DCF model can be applied for all classes and sizes of companies.

Regarding that Aeris Energia is a company that constantly generates positive cash flows, the Discounted Cash Flow will be an appropriate model to value the business. Besides, most part of Aeris Energia´s balance sheet is formed by property, plant and equipment (PP&E), and inventories, what turns the company´s operation more tangible, compared to technology companies. Much of Aeris Energia´s revenue comes from wind blade manufacturing contracts with a few clients.

2.2.4 - Discounted Cash Flow

The two main ways to perform a valuation by DCF are by Free Cash Flow to Equity (FCFE) and Free Cash Flow to Firm (FCFF). In this first case, the cash flow goes exclusively to the shareholders of the company, depending only on the company´s equity. In this case, the cash flows are discounted by the cost of equity (Ke), which is the rate that equity investors charge to assume the risk of investing in the company, and it returns the equity value (or market capitalization). In order to obtain the Enterprise Value, the net debt is summed to the equity value, or it is obtained direct by discounting the free cash flow to firm, which are the cash flows destinated to all stakeholders of the company (including debt holders). In this case, the cash flows are discounted by a rate that reflects the costs not only for shareholders, but also to the debt holders. The formulas to calculate the FCFE and FCFF for each period are:

Figure 6: FCFF and FCFE

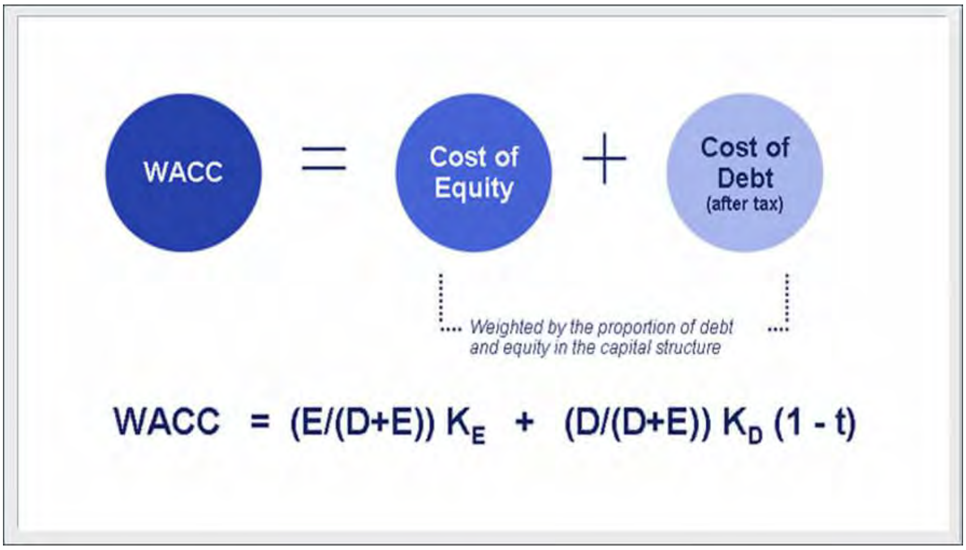
$$\text{Free Cash Flow to Equity (FCFE)} = \text{Net Income} + \text{D\&A} - \text{Increase in NWC} - \text{CapEx} + \text{Net Borrowing}$$

$$\text{Free Cash Flow to Firm (FCFF)} = \text{NOPAT} + \text{D\&A} - \text{Increase in NWC} - \text{CapEx}$$

Source: Wall Street Prep

The Free Cash Flow to Firm accounts for the cash flows that serves all stakeholders from the company. Therefore, the valuation theory considers the Weighted Average Cost of Capital (WACC) to discount the FCFFs, which is calculated by:

Figure 7: WACC Formula



Calculating the cost of debt consists in taking all debt amounts issued by the company, and weight them by their interest rates and proportional weight based on the total amount of debt issued. Since the employment of the Free Cash Flow to Firm assumes a constant capital structure, and it is not necessary the forecast of the company interest payments, the tax shield benefit from the debt issued is captured in the WACC, by multiplying the Kd by (1-T), where T if the effective tax rate. In the calculation of the cost of equity, it will be considered the capital asset pricing model (CAPM), which is used in finance to determine the appropriate theoretical rate of return of a given asset in relation to a perfectly diversified market portfolio. The calculation of the Ke follows the formula:

Figure 8: Cost of Equity

$$\text{Cost of Equity} = \text{Risk Free Rate} + (\beta \times \text{Equity Risk Premium})$$

Source: Wall Street Prep

The idea behind this theory is that investors charge a rate that is the risk free rate summed with a market risk premium, which is obtained by the second part of the equation above. The β captures the risk of the individual business, compared to the market risk, and the Equity Risk Premium (ERP) compares the returns of the equity market with the returns from the risk-free rate. Thus, the β is responsible to capture the non-systemic risk, and is calculated by a OLS regression between the returns of the asset and the returns from the reference benchmark. In order to get a more reliable beta, it is usually recurred to deleverage the betas from the comparable peers of the company that is being evaluated, get the median from the sector e leverage again by the capital structure from the company that is under evaluation.

The discounted cash flow formula is:

Figure 9: Discounted Cash Flow Formula

(2) *Fair Market Value Estimate*

$$\text{Value} = \sum_{n=1}^{t} \frac{CF_n}{(1+i)^n} + \frac{TV_t}{(1+i)^t}$$

where

CF = cash flow
i = discount rate
n = time periods, time = 1 to t
TV = terminal value.

Finally, regarding the calculation the terminal value in the equation above, a hypothesis of a going concern should be chosen for Aeris Energia, which consists in the assumption that the company will operate forever. In this context, the company will generate cash flows forever, and therefore, at the moment the cash flows stabilize, we calculate the present value of a perpetuity, assuming a perpetual growth rate that will take effect. The formula to calculate the present value of a perpetuity is:

Figure 10: Perpetuity Formula

$$\textbf{Present Value of Perpetuity} = \frac{FCF_T x\ (1+g)}{(r-g)}$$

Other ways to calculate a Terminal Value is by assuming an exit multiple, or the liquidation of the company in the final period.

In order to summarize the discounted cash flow theory, the main equations to find the market cap, in the case of discounting the FCFE, and enterprise value in the case of discounting the FCFF, are:

Figure 11: Valuation Formulas

$$\textit{Market Cap} = \sum_{t=1}^{T} \frac{FCFE_t}{(1+Ke)^t} + \textit{PV of perpetuity}$$

$$\textit{Enterprise Value} = \sum_{t=1}^{T} \frac{FCFF_t}{(1+WACC)^t} + \textit{PV of perpetuity}$$

$$\textit{Enterprise Value} = \textit{Market Cap} + \textit{Net Debt}$$

Concerning the Aeris Energia valuation, the FCFF method will be used in order to find the value for all the stakeholders.

3. Expected Results

Since the main objective of this essay is to analyze the impact from the increase of the wind power energy source in the Brazilian total energy production and its impact in the intrinsic value of Aeris Energia, by making estimations (through regressions) of the relationship between this increase in the share of the wind power and the growth value drivers (Equivalent Production in MW from Aeris Energia Wind Blades), and also by making scenario analysis in the discounted cash flow model, I may assume that there is a positive impact between those variables, and this is impact will be significant.

My hypothesis is that recent growth in the wind power energy source was a major determinant of growth Aeris Energia´s intrinsic value, that operates in the value chain from this industry. Even though analyzing the industry growth and the opportunities it generates to increase revenues and cash flows are essential in a fundamental analysis, many companies manage to increase its value and gain market share even if the industry in which they operate is highly competitive and does not register such relevant growth, due to high quality management, efficient operations and cost reduction policies, differentiated products or services, and other variables which drives growth.

However, in the case from Aeris Energia, since the company was founded in 2012, and it already earns more than 2 billion Brazilian reais, it is expected that this growth was significantly influenced by this wave of strong growth that presented the industry in the last years, and other variables such as management, service and product quality and internal policies should be less relevant to the company growth. The wind energy generation industry became much impressively more relevant in the Brazilian electrical matrix in the last decade, as we will see in the next session, and Aeris Energia opportunistically took advantage of this growth to lift itself up, but it is no guarantee that it will maintain its returns and profitability for years to come.

4. Wind Energy Industry

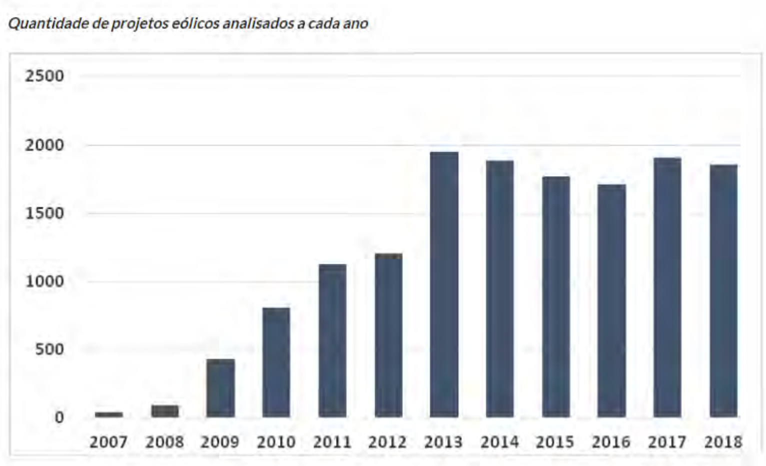
The wind power source of energy was implemented recently in Brazil, with the first wind turbine established in 1992. But it was during the 2001 rationing crisis, that there was an attempt to encourage the hiring of wind power generation ventures in the country. The Emergency Wind Energy Program (PROEÓLICA) was created, aiming to hire 1.050 MW of wind energy projects by 2003. However, this program didn´t obtained the pretended results, and was replaced by the Incentive Program for Alternative Sources of Electric Energy (PROINFA), that encouraged the development of renewable sources in the energy matrix, as well as it paved the way wind turbines and components industry in Brazil (ABEEólica).

In the decade of 1990s, there was a reform in the Brazilian energy industry, no longer being a model totally centralized in the control of the state, for a model in which the private sector could act. In 2004, there was a reformulation of the model undertaken in the 1990s, and there was a creation of two parallel environments: Regulated contracting environment (ACR) and free contracting environment (ACL). This law marked changes in the energy trading environment. The regulated environment contemplates the purchase by distribution companies in public auctions to meet their captive consumers; and the free environment, comprises the purchase of electricity by non-regulated entities, such as Free Consumers and Traders (Senju, Gomes, 2006). Since 2004, the contracting of electricity in the regulated environment of the Brazilian Electricity System has taken place through auctions, and the first in which the wind source participated occurred in 2007.

In 2009, the first energy commercialization auction exclusively focused on wind power took place. This auction was denominated Reserve Energy Auction (LER), and was a success, with a contracting of 1.8 GW, paving the way to new auctions in the next years. During the period that the PROEÓLICA and PROINFA programs were created, the wind power energy generation technology was still very expensive (Cenários Eólica, 2019). Over the years, it was possible to perceive several technological changes, in addition to a growing worldwide interest in betting on green alternatives of energy, that lead to a reduction in the energy cost and impacted positively in the performance of wind power projects. Between 2015 and 2019, wind energy industry generated more than 652 billion dollars in investments (Jennifer Thomas, 2021).

Since the first auction that the wind power energy participated, there were more than 30 auctions with this source of energy. Part of this is due to technological developments, that improved the quality and size of wind turbines, clean energy and another fact is that certain regions of the country, such as in the Northeast and South of Brazil, have winds with high average speeds that has little variance of directions and less speed fluctuation, which contributes to this position. As a result, Brazil is one of the countries that has highest average capacity factor, that is calculated by dividing the energy generated during a period by its total installed capacity. Whilst the average onshore capacity factor of all the countries analyzed by IRENA was worth 29% in 2017, that of Brazil was above 40% (Cenários Eólica, 2019). In the graph below, we can see the number of wind projects analyzed each year:

Figure 12: Wind Power Projects Analyzed per Year



Source: EPE

It is possible to emphasize the concentration of wind power plants in Brazil in the Northeast and South regions from Brazil by observing the map below, in which there are 1026 wind farms spread across the country, with more than 600 already in operation:

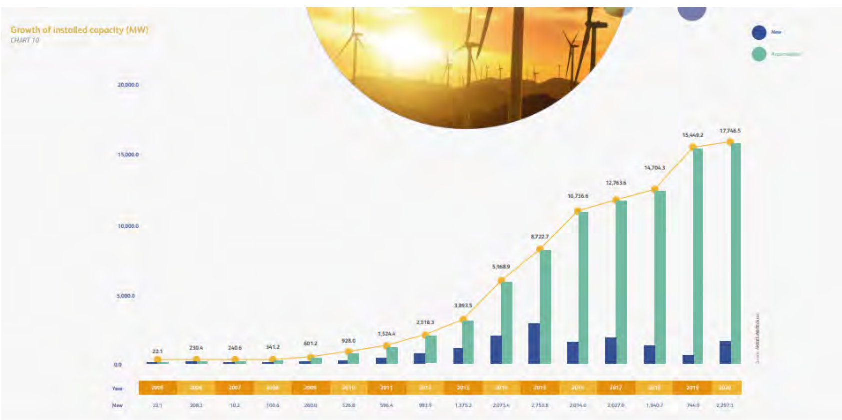
Figure 13: Location of Wind Power Plants

Imagem 1. Matriz elétrica brasileira. Fonte eólica.

Source: ANEEL

Thus, the wind source of energy is growing in a very accelerated pace in Brazil and represented 11% of the Brazilian electrical matrix in 2021, achieving 20 GW of installed power. The Brazilian government expects that by 2026, wind power plants pass the thermal plants in terms of installed power and become the second largest source of energy in the country. According to the Global Wind Energy Council, it brings Brazil among the top five markets in the world in 2021 for new installations, along with China, the United States, Vietnam and the United Kingdom. Combined, these five markets accounts for 75.1% of the world´s wind power installations (Gov.br, 2022). In the chart below, we can see the evolution of the installed capacity from wind energy.

Figure 14: Installed Capacity from Wind Energy



In 2021, there was a law project passed by Jair Bolsonaro that regulates offshore power generation projects, in which generates electrical energy by power plants installed in inland waters or at sea. The authorization for offshore electricity generation will be given by Ministério de Minas e Energia (MME), the Brazilian energy regulatory body, through the signing of a contract for the onerous use of a public asset. The National Energy Plan 2050, prepared by EPE (Empresa de Pesquisa Energética), points to an installed capacity for generating electricity by offshore wind of 16 GW, what would be potential growth drivers for companies that operates in this sector, in addition to being a great booster of the Brazilian electrical matrix transition (Agência Senado, 2022).

The wind power energy fits into the global ESG trend, since it is a renewable source, with low environmental impact and low levels of greenhouse gas emissions. Besides, the construction of wind farms promotes positive social impacts in the regions where they are being installed, generating employment and greater access to energy for communities that do not have large water resources. Therefore, given that the wind power energy is achieving expressive results in the Brazilian economy, a question that comes to mind is which companies are benefiting from this strong growth of this industry? And how can we measure this impact in these firms operational and financial metrics, regarding that the imminent continuation of the growth in this source may bring good investments opportunities in this sector? That´s one of the questions that I will try to address in this essay, by analyzing the impact of the growth of the wind energy generation industry in Aeris Energia intrinsic value, which is a Brazilian manufacturer of wind power blades for wind turbines.

5. Aeris Energia business

5.1. Overview

Aeris Energia is a Brazilian leader in the manufacturing of wind blades installed in wind turbines. The company was found in 2010 with the aim of exploring the opportunity of global energy transition to the wind energy source, and also to take advantage of the increasing outsourcing demand in the manufacturing of wind blades by OEMs (Original Equipment Manufacturers). The Aeris Energia wind blade production plant became operational only in 2012, in the strategic region of Portuário do Pecém, in the state of Ceará.

The factory location was strategically chosen to be in the Northeast of Brazil, region where wind power plants in the country are mostly concentrated, in addition to being situated next to the coast, that facilitates the transport of its products not only within the country, but also exports to other countries. The position of the production unity allows lower costs in the delivery of its production to the final customer.

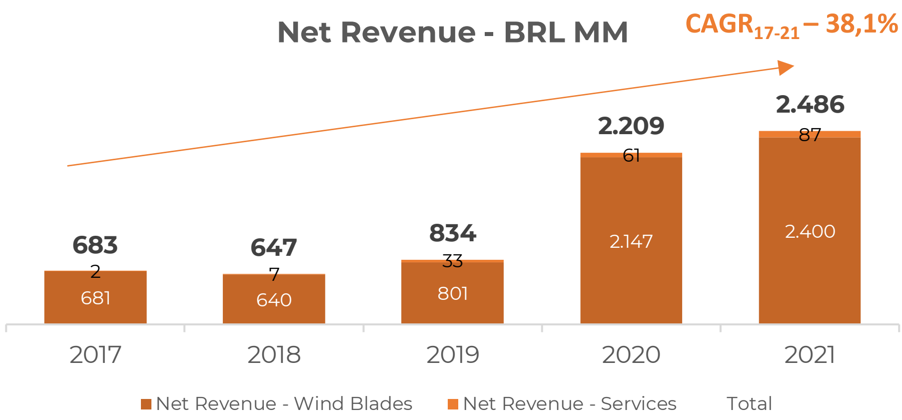
The value chain in which Aeris Energia is positioned consists of:

Figure 15: Wind Blade Manufacturing Chain

The Original Equipment Manufacturers (OEMs) are responsible for the production of wind turbines to supply wind power energy generating companies, and during its manufacturing process, they outsource the production of wind blade. This outsourcing trend is a result from the need for cost reduction, as well as the possibility to concentrate in its core business, and to increase efficiency and productivity its processes. Pressure to reduce costs and to have a greater agility in their supply chain are making OEMs outsource the wind blade production.

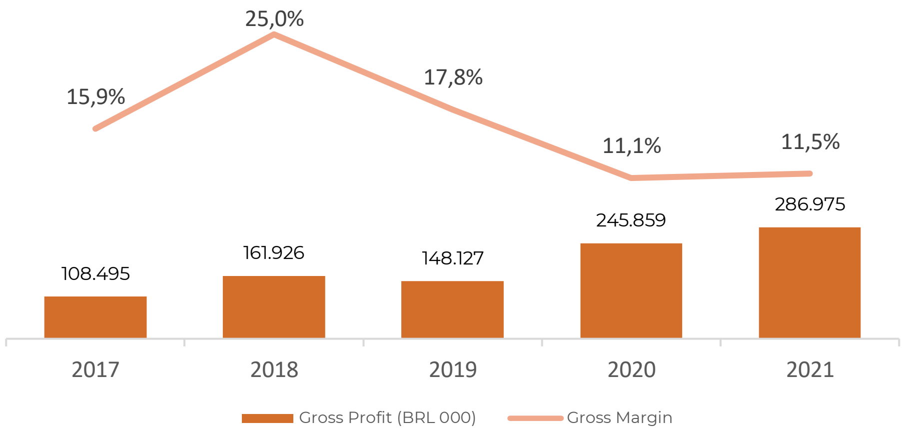
Thus, the main source of revenue from Aeris Energia consists of signing wind blade production lines contracts with its five customers: Vestas, General Electric, Nordex Acciona, Weg and Siemens Gamesa. Since the beginning of the company's manufacturing operations in 2012, there has been a significant increase in the portfolio of new customers. In 2021, Aeris Energia signed a supply agreement with Siemens Gamesa, and in 2022, it extended its contract with the Danish Vestas until 2026, and it will be responsible for the production wind blades from multiple models. Those recent movements are consolidating Aeris Energia as a global wind blade scale supplier. Aeris Energia complementary source of revenue is wind farm inspections and maintenance services, which accounts for ~4% of the company total revenue.

From 2017 to 2021, Aeris delivered a 38,1% growth in its revenues, largely driven by the increase in the wind blade supply agreements with new clients and the volume increase in the existing contracts. The agreements signed with its customers includes inflation costs transfer to the wind blades sets price, and therefore, 2021 revenue was boosted by rising inflation costs in raw materials, and not necessarily by a growing perception of value in Aeris Energia´s products.

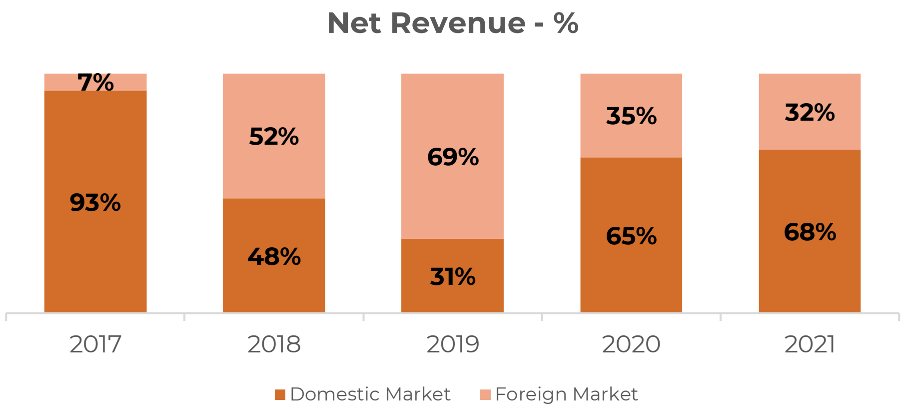


Besides, when Aeris Energia signs a new wind blade supply agreement, the company has an initial expenditure to improve its production facilities to adapt to the new line production, which implies in higher capital expenditures. Each client has its own product line demand, which can vary in size and structure, and requires further modification in the industrial park of the wind blade supplier to be able to manufacture the products according with its client specifications. Over time, the size of the wind blades installed in wind turbines increased significantly, and they resulted in higher electricity generation per wind turbine. Therefore, by the time each new contract is established, Aeris Energia business model includes significant capital expenditures to be able to manufacture those lines, and consequently the profitability and return on invested capital decreases in the earlier years of the contract, what is understood by the company by unmature lines of production. Nevertheless, in 1-2 years those lines starts to mature, and ratios such as ROICs and profitability margins increases.

In additional to this initial impact from capital expenditures in the earlier years of contracts signed with customers, the manufacturing process also includes raw material costs, that are worth 80% of the total costs from the company business model, and the other 20% are mostly labor costs. Although Aeris Energia transfers cost inflation and raw materials price volatility to the wind blade sets that are sold to customers, rising inflation still impacts the company´s gross margin, which suffered in the last years:



The wind blade manufacturing process is labor intensive, and since labor costs are less expensive in Brazil than in developed countries, it is cheaper to manufacture wind blades in Brazil, despite the logistical costs that are incurred. In other words, cheaper labor costs in Brazil drives demand for Aeris Energia wind blades, and the company factory location in Porto do Pecém, in the state of Ceará, optimize logistical costs given that is situated next to the coast and to developed countries in Europe and North America. As a result, exports represented more than 50% of Aeris Energia´s total revenues in 2018 and 2019:

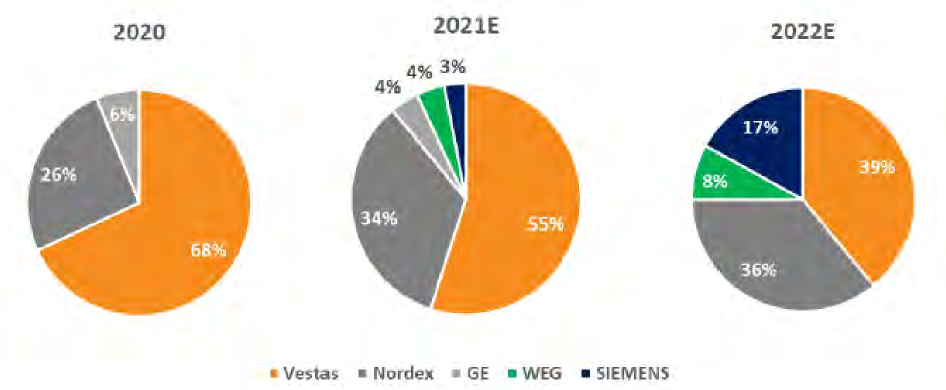


The Company's growing presence in the international market allowed the acquisition of its wholly owned subsidiary, Aeris Services LLC and the beginning of operations in the services division in the United States. In 2019, ~, 70% of the manufcatured volume was delivered to the United States. Besides, Aeris Energia´s 2021 agreement with Siemens Gamesa includes the production of wind blades with total capacity equivalent to 3.8 GW of power in a total value estimated at BRL 3.0 billion. Moreover, 80% of Aeris´s customers are foreigners.

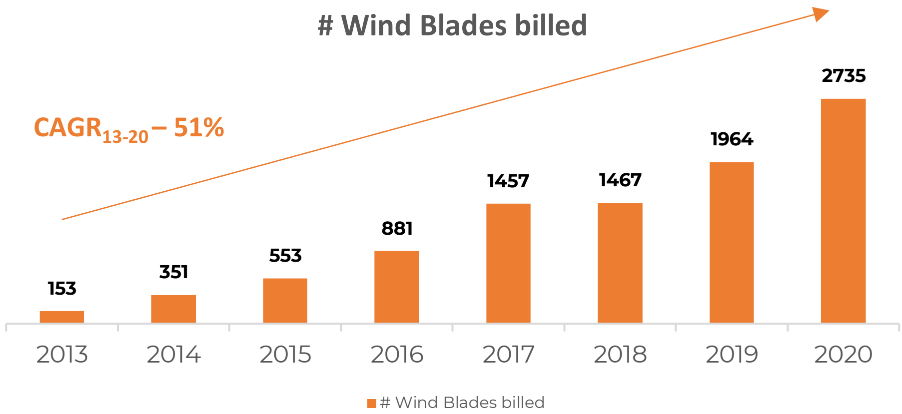
5.2. Operational Data

Although Aeris Energia participates in an extremely promising industry, especially with the new ESG trend, which drives the demand for the wind energy source, one of the biggest risks conceived by analysts to the company is the customer concentration. In the chart below, it is possible to observe Aeris Energia´s revenue according to supply contracts of wind blades per customer:

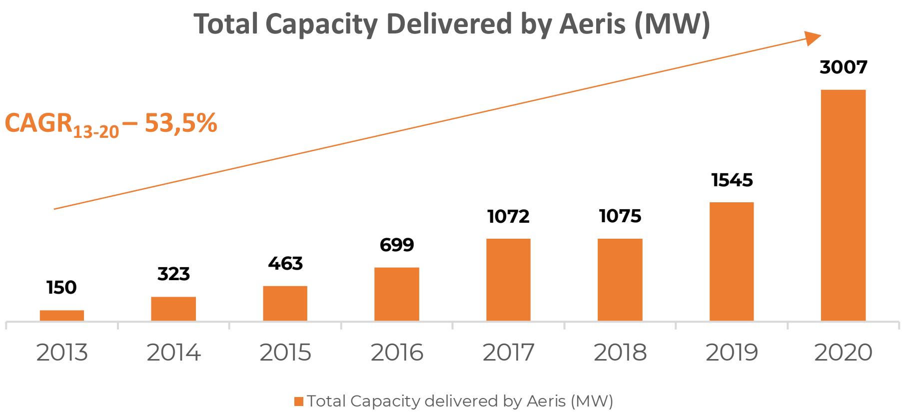
Figure 16: Revenue per Customer



In 2020, 68% of the company revenue came from Vestas contracts. In 2021, Aeris signed a wind blade contract with Siemens Gamesa and with the Brazilian Weg. On the other hand, since the beginning of the operations Aeris Energia has managed to deliver a compound annual growth rate from 51% in the number of wind blade sets billed, which reflects the increase in the demand for outsourcing by its main clients and also de signing of new contracts with new OEMs, such as Siemens and Weg. Despite the current client concentration, Aeris Energia is managing to diversify its customers base and is largely exposed to the OEMs outsourcing trend.

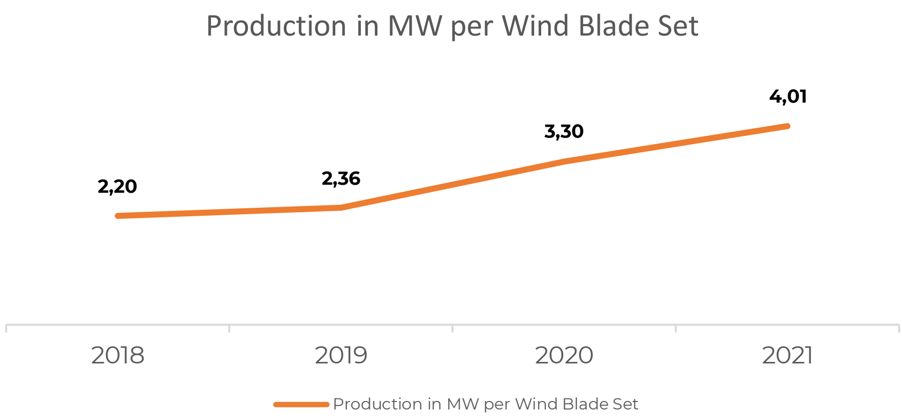


Furthermore, since the beginning of Aeris Energia operations, the total equivalent capacity delivered by Aeris grew 54% per year, as a result of the expansion of Aeris Energia´s industrial park to attend the demand for new production lines and bigger wind blades. For instance, the number of wind blades billed in 2020 was 2.735, the total installed capacity of Aeris Energia´s industrial park was 5.100 wind blades, which is equivalent to 6 GW of power. Therefore, when a new production line is contracted, Aeris expands its property plant and equipment.



Wind blades per year	2018	2019	2020
Installed Capacity	2.550	3.570	5.100
Production	1.457	1.964	2.735

During the last years, the size of wind turbines and wind blades increased significantly, which caused an increase in energy produced by land space used. Aeris adapted its production to attend the demand from new wind turbines, and the equivalent production in MW per Wind Blade Set manufactures grew significantly in the last years, influencing the net revenue growth from wind blades. In the chart below, it is possible to evaluate this increase in the production in MW per Wind Blade Set, reflecting the evolution in the manufacturing technology:



5.3 - Management

The board of directors is formed by 5 members, including Aeris Energia´s founder Alexandre Funari Negrão, who has who has an extensive track record in business administration and entrepreneurship. Prior to creating Aeris Energia, Alexandre was President of the Executive Board of Medley S/A Indústria Farmacêutica. Besides, the board is also formed by 2 independent members. The table below summarizes the members from the board of directors as well as their positions:

Figure 17: Board of Directors

Board of Directors	
Name	Position
Alexandre Funari Negrão	Board of Directors - President
Luiz Henrique Del Cistia Thonon	Advisor
Gisela Sarnes Negrão Assis	Advisor
Edison Ticle de Andrade Melo e Souza Filho	Independent Advisor
Rogério Sekeff Zampronha	Independent Advisor

Besides, Aeris Energia´s counts with 5 directors, all with a term of office of 3 (three) years, reelection being permitted. The president Bruno Cunha joined the company during its foundation, together with Alexandre Negrão, and the others 4 directors. All of them have been working since the beginning of the company and have held various positions throughout the firm's history.

Figure 18: Executive Directors

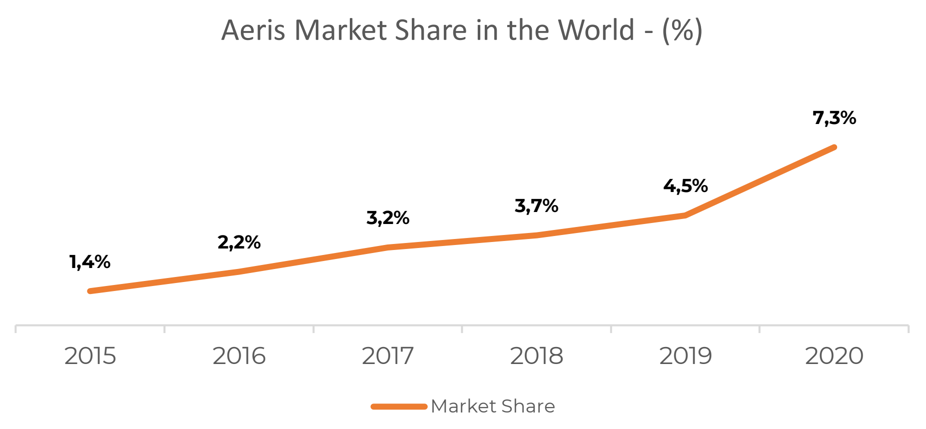
Executive Directors	
Name	**Position**
Bruno Vilela Cunha	President and Commercial Director
Bruno Lolli	Planning and Investor Relations Director
Cassio Cancela e Penna	Human resources director
Daniel Henrique da Costa Mello	Industrial and Operations Director
Vitor de Araujo Santos	Technology and Operations Director

Aeris Energia is positioned at Novo Mercado, Ibovespa segment that brings together companies with the best corporate governance practices. Such rules expand shareholders' rights and improve the quality of information provided to shareholders.

Even though the founders maintenance within the executive board indicates that they are committed to generating positive results and from exploring the opportunities in the industry, the absence of changes in the board can cause the company's growth to stagnate as people with different experiences and knowledge are not taking part in the company's strategic decisions. When a company reaches certain size point, a change in management may be necessary to address new visions and strategic decisions for the company.

6. Competitive Landscape

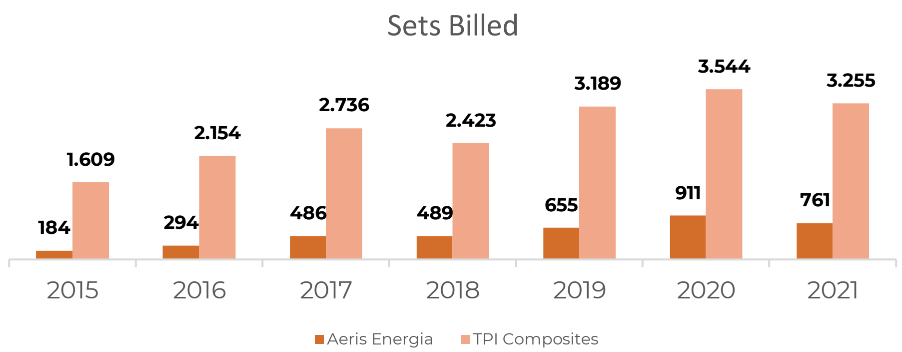
According to GWEC, Aeris Energia´s market share in the world (excluding the chinese market) was 7,3% in 2020, and in the national market, the company accounts for 89% of the total market. Over time, Aeris Energia has increasingly managed to increase its share in the world:



The wind turbine manufacturing is largely concentrated on the largest OEMs. Likewise, the wind blade manufacturing market it is also highly concentrated mostly in two players: the Brazilian Aeris Energia, and the American company TPI Composites. Nonetheless, Aeris largest competitor is not only TPI Composites, but also the OEMs themselves, which outsource part of their wind blade manufacturing operations. For instance, in 2017, GE Wind, which is one of the largest wind turbine manufacturers, completed its acquisition of LM Wind Power (LM), one of the largest competitors from TPI Composites and Aeris Energia.

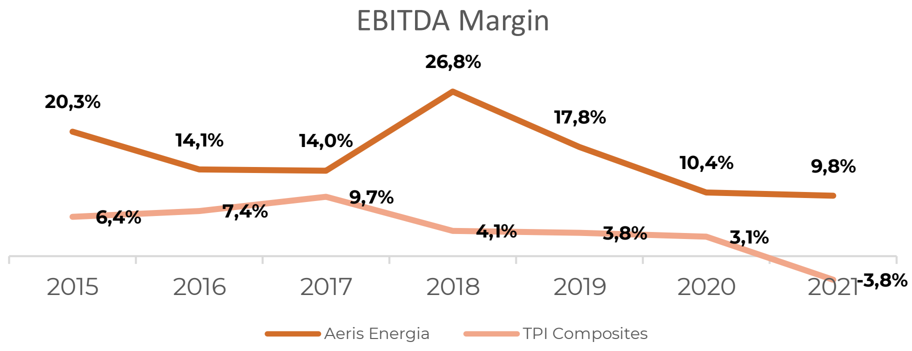
The main competitive variables in the wind blade market includes reliability, total delivered cost, manufacturing capability, product quality, engineering capability and timely completion of wind blades (TPI Composites – Annual Report 2020). The wind blade manufacturers main investment thesis comes precisely from the outsourcing movement from those players, that are willing to reduce costs, increase returns and focus on the production of wind turbines. The quality from the wind blades produced it is also one of the aspects which attracts the big OEMs, and Aeris Energia and TPI composites are continually looking to improve its technology and to attend its clients demands.

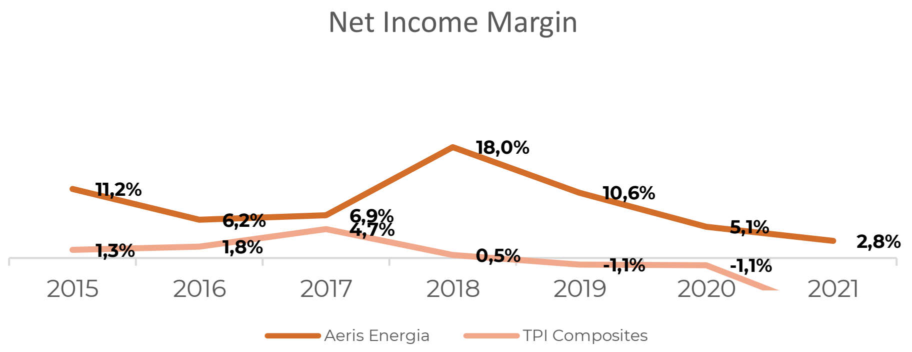
Comparing the business from Aeris Energia and TPI Composites, both mostly focus in the manufacturing of wind blades according to the customer demand contracts that are signed with the biggest OEMs. Aeris Energia and TPI have customers in common, such as Vestas, Nordex and General Electric, which are companies with global operations and with demands for wind blades varying between regions of operation. In the graph below, it is possible to observe that TPI manufactures a larger amount of wind blade sets compared to Aeris Energia:



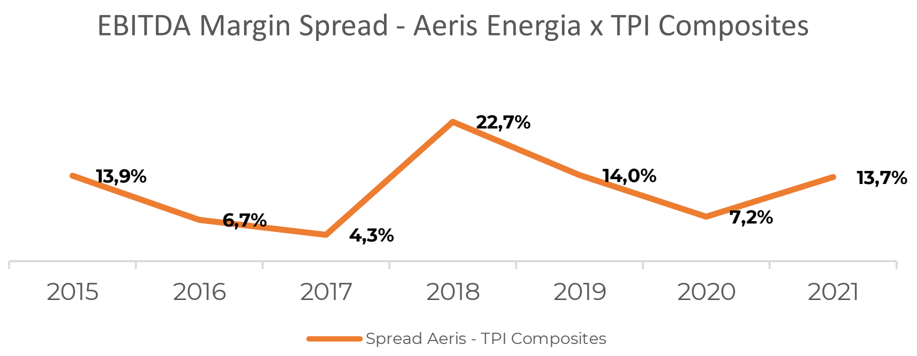
TPI composites has several production plants in different regions of the world to facilitate the distribution logistics operation for its customers. Nevertheless, the company doesn´t have manufacturing facilities in Latin America (Excluding Mexico), where Aeris Energia is consolidated. TPI has factories in the United States, China, Mexico, Turkey and engineering centers in Denmark and Berlin. On the other hand, Aeris Energia have a single factory in Porto do Pecém (CE), located in Brazil, and is continuously increasing its production capacity in this region, which is strategically positioned geographically.

Comparing Aeris Energia and TPI composites financial metrics, the Brazilian company has constantly delivered higher margins than TPI composites:





The spread between the margins from both companies is mostly due to the higher costs of goods sold involved in the operation of TPI Composites. A question which quickly comes to mind is if Aeris Energia can sustain those higher margins than TPI composites, which is a larger and older company, and if this difference is caused by high quality raw materials used in the production of wind blades from TPI composites. However, higher margins can also indicate competitive advantages from Aeris Energia. When analyzing the spread between the EBITDA Margin from both companies, it is possible to observe that this difference is maintained along the time, and we do not have an indication that these margins are converging:



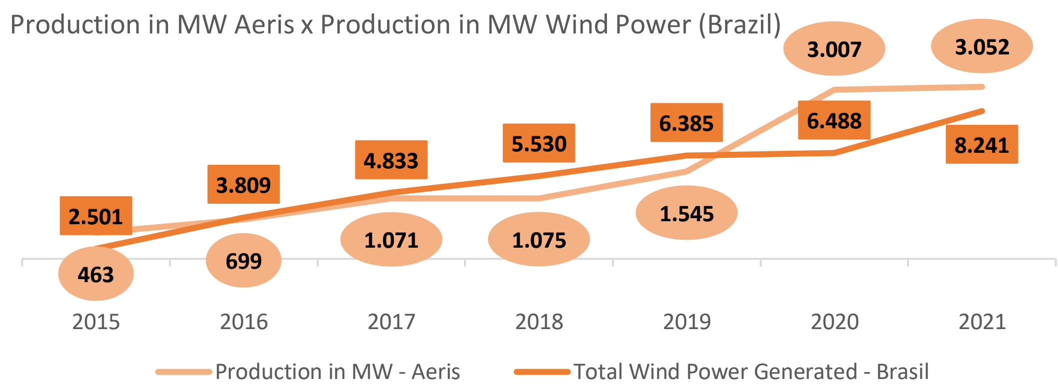
This questioning and analysis about Aeris Energia and TPI composites margin spread is essential when arguing our valuation assumptions.

7. The growth of the wind energy industry and the impact in Aeris Energia

Having analyzed Aeris Energia´s business model, as well as the qualitative and quantitative features which affects its operations, it is possible to explore the question if the growth of the wind energy generation industry in Brazil is the main variable that drives the company´s financial and operational metrics, and consequently, its intrinsic value. In order to make this study, it was used data from the production in MW equivalent from the sale and installation of wind blades sets in wind turbines, made available by Aeris Energia in its investor relation website, which is a driver from the company´s revenues. This data allows the comparison with the wind power energy generation evolution in Brazil, in order to evaluate the correlation and the relationship between those variables and analyze if the growth of Aeris Energia was mainly driven by the industry growth.

Since Aeris Energia was founded in 2012, the data provided corresponds only to the years from 2015 until 2021, which is a small sample that prevents the estimation of well-reliable regressions with the appropriate controls. As the sample consists of 7 elements, the estimation of the regression with a high number of controls, that affects the variable of interest, would imply an estimation with few degrees of freedom. Besides, Aeris Energia only provides quarterly data from 2019 onwards, which would still imply a low number of observations in the sample

Nevertheless, in order to evaluate and have an idea of how much of Aeris Energia´s growth was due to the industry growth, it is possible to perform a graphical analysis of how the two variables behaved over the last 7 years:



It is possible to observe in the graph above that both the equivalent production in MW from Aeris Energia´s wind blade sets, and the total wind power generated in Brazil delivered a similar behavior and growth that might be an indication of relationship between those variables, specially between 2015-2017, although the law of small numbers means that it cannot be concluded. A regression with a higher number of observations, together with appropriate controls that affects the variable of interest (production in MW of Aeris Energia), such as the energy consumption, energy generation from other sources, GDP, would return most reliable regressors for the analysis. This difficulty must be mitigated over time, as Aeris Energia makes new results available with the variable of interest.

Nonetheless, if a scatter plot is sketched with Aeris Energia´s equivalent production in MW sample, and with the wind power energy generation in Brazil data, the resulting regression from this relationship point out a positive correlation, as we can observe in the graph below:

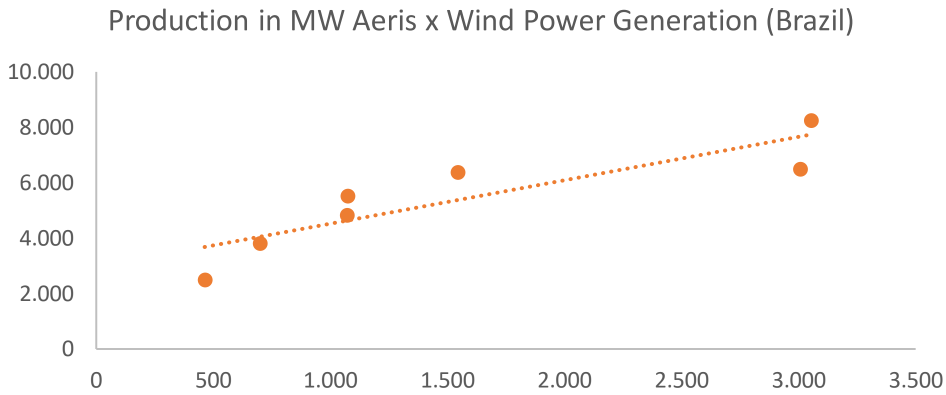


Figure 19: Regression Statistics

Summary Statistics Results

	Dependent variable:
	Prod.MW
Gera.Eólica	0.491***
	(0.120)
Constant	-1,093.270
	(681.454)
Observations	7
R^2	0.770
Adjusted R^2	0.724
Residual Std. Error	556.728 (df = 5)
F Statistic	16.743*** (df = 1; 5)
Note:	*p<0.1; **p<0.05; ***p<0.01

Recurring to the R software to estimate this regression, we obtain a positive regressor of 0.491 for the industry wind power energy generation, with a standard error of 0.120, which reports a t-statistic of 4.092, indicating that this regressor is significant at a 10% significance level. The result also reported a R^2 value of 77%, what cannot be treated as reliable, since this regression is considering a small sample and controls were not included, and it might be an indication from spurious regression, since there are other variables such as high-quality management, number of competitors that should influence the dependent variable. Despite its limitations, this regression returns a positive relationship, as well as the results observed in the graph with the evolution from both variables.

8. Valuation

After understanding Aeris Energia´s business, its competitive scenario, its management, in addition to analyzing how the wind energy industry might impact the company´s results, in order to value Aeris Energia, it is necessary to assess the industry's impact on the company's intrinsic value.

The main assumptions used to evaluate the company will be described in the sections below:

8.1 – WACC

8.1.1 – Cost of Equity (Ke)

Firstly, the beta used to calculate the cost of equity from Aeris Energia was 0,93, extracted from the platform S&P Capital IQ, which is the regression of Aeris Energia's 1-year returns with the returns from Ibovespa index. It was chosen this time interval due to the fact that Aeris Energia initial public offering (IPO) was in November 2020 and taking 1-year returns would avoid the volatility caused by the pandemic.

Besides, the risk-free rate (Rf) considered the returns from the American T-Bill, of 3,69% per year. The american equity risk premium (ERP) was taken from the Damodaran website, according to the country´s rating, which is a result of the historical excess of equity market return over the return of US government bonds (considered risk-free).

Since the assumptions used to calculate Aeris Energia´s cost of equity were made by taking in consideration American parameters, it was summed the country risk (calculated by EMBI+). A company premium of 1% was added to the cost of equity calculation to compensate the fact that Aeris´s IPO was made recently, and therefore, we don´t have much historical data from its returns, which can skew the beta output. Furthermore, in order to convert the cost of equity from dollars to Brazilian reais, it was considered the inflation differential between Brazil and the United States. The following table summarizes Aeris Energia´s cost of equity calculation:

Ke - USD	**11,63%**
Beta	0,93
ERP	4,24%
Rf	3,69%
Embi +	3,00%
Company premium	1,00%
Ke - BRL	**12,67%**
IPCA - Brazil	3,50%
CPI - US	2,55%

Hence, the cost of equity used to calculate Aeris Energia´s weighted average cost of capital (WACC) was 12,67%, a rate which is slightly above the long-term returns of Brazilian government bonds. This return is consistent with Aeris´s rating.

8.1.2 – Cost of Debt (Kd)

The cost of debt was calculated by dividing the total interest paid by Aeris Energia over its total gross debt. This calculus was made from all the historical years from 2017 until 2021, and it was considered an assumption that, as Aeris Energia grows and raise its rating, the cost of debt will decrease. As a result, the cost of debt (kd) used in the calculation was 15% nominal for the long-term, whereas in 2021 was 19% nominal.

8.1.3 – WACC Calculation

In short, the main assumptions used to calculate the WACC are summarized in the table below:

WACC - BRL	11,9%
Ke	12,67%
Kd	15,00%
E/(E+ND)	72,3%
ND/(ND+E)	27,7%
t	34%

It was considered the company current capital structure to weight equity and debt costs when calculating WACC. The Brazilian statutory tax rate of 34% was also considered to capture the tax shield from issuing debt, which can be beneficial for the company, since it reduces the calculation basis for paying taxes.

The weighted average cost of capital used to discount Aeris Energia´s cash flows was 11,9% nominal.

8.2 – Financials forecasts

The choice for the free cash flow to firm (FCFF) to value Aeris Energia was made with the goal to capture the value not only for the company´s shareholders, but also to all stakeholders related to Aeris Energia. By taking this model, we assume that the company capital structure will remain constant for all the forecasted years, which may be an unreal assumption, since Aeris has room to raise more debt to finance production lines expansion projects, to attend the demand from its clients. Nonetheless, the objective of understanding how the sectoral growth of the wind energy segment impacts Aeris Energia value is not affected by this limitation. The whole model was built in nominal terms.

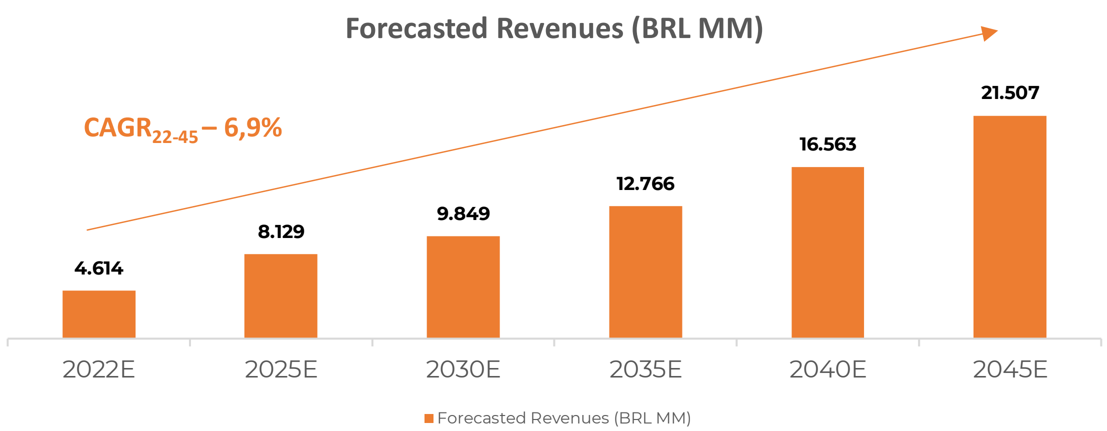
8.2.1 – Revenues and Unit Economics

In order to forecast Aeris Energia´s revenues, the understanding of the business model and the company´s unit economics was essential. Using data made available by the company, the first variable analyzed was the production in MW equivalent to the center of the nominal power range of the wind turbines equipped by the billed sets. Besides, the number of wind blade sets (package with 3 wind blades) billed is made available by the company, and with those variables, it is possible to calculate the production in MW per wind blade set. This indicator reflects the technology of the wind blade sets, since the growth of this indicator tells that the wind blades are capable of resulting in a bigger production in MW.

To attend the demand from the OEMs, Aeris Energia is expanding its production capacity and is investing in expansion from its productive park, to support the production of larger and more technological wind blades, increasing the production in MW per wind blade set. Therefore, in order to estimate the number of sets billed, it was forecasted an increase in the production in MW per wind blade set, with a decreasing year-on-year growth until 2027, when this growth stabilizes at 2% per year (when the fast-growing pace from the wind energy industry might slow down). Besides, the forecasts from the total production in MW for the domestic market were based on the planning director Bruno Lolli, that pointed out a 4.200 MW production to the domestic market and 1.200 for the foreign market in 2022. Thereafter, a declining annual growth was projected until 2027, the year in which there is stabilization of the production in MW. Those assumptions were mainly based to the fact that the wind power energy segment is growing a lot nowadays, and it is increasing its share in the Brazilian electrical matrix, and this strong growth should slow down as we already have several wind power plants distributed throughout Brazil. However, there is still plenty of room for growth even after this date. Regarding the positive relationship between the increase in energy generation by the wind source and the equivalent production in MW from Aeris Energia analyzed in the previous section, it is reasonable to assume that the growth of the industry will push the growth from Aeris Energia.

This strong growth in the next year might be boosted by the implementation of offshore wind energy projects. Recently, the infrastructure commission (CI) from Brazil approved the project of the regulatory framework for the exploitation of energy —whether wind, solar — on the high seas in Brazil. The project still must be analyzed by the Chamber of Deputies. The rule applies to projects located off the Brazilian coast, such as the territorial sea, the continental shelf and the Exclusive Economic Zone (Agência Senado, 2022). The approval of the exploration of offshore energy can be a revenue driver for Aeris Energia, and should be considered in the revenue projection.

Moreover, given the historical revenues from the domestic and foreign markets, it was calculated an implicit price per wind blade set in 2021, corresponding to BRL 3,129 MM. This price was converted to dollars, and it was forecasted a CPI growth in this wind blade set price, in addition to a real growth in the first 3 years of forecasts (2022-2024), reflecting costs increases from the high inflationary environment resulting from imbalances in the supply chain caused by the pandemic and Russia and Ukraine wars. The CPI and exchange assumptions were taken from Itaú Long-term forecasts. Having the implicit price per set forecasted, as well as the wind blade sets, it is possible to forecast Aeris´s revenues:

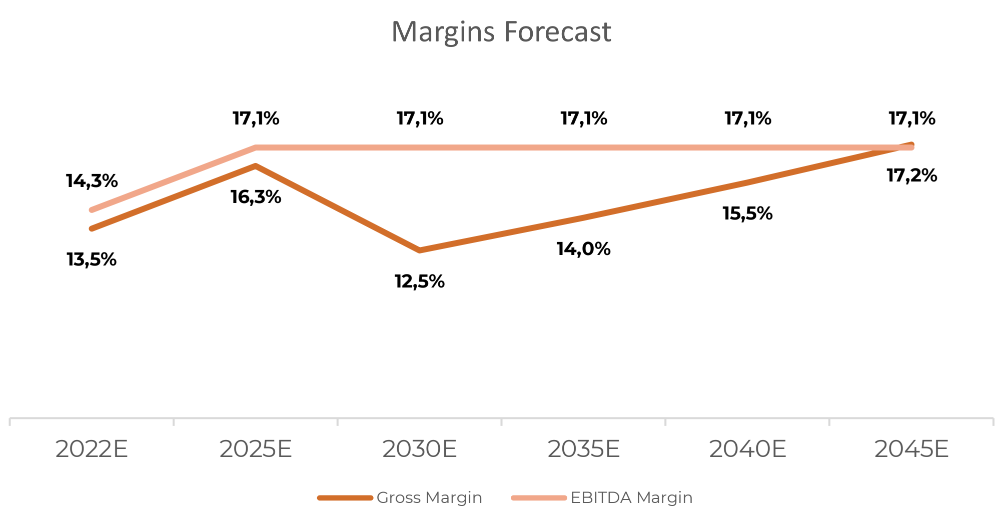


The revenues are expected to deliver a 6,9% CAGR from 2022 until 2045, with a strong growth centered in the short-term.

8.2.2 – Costs, Expenses and Margins

When Aeris Energia firms a wind blade manufacturing contract with its customer, in order to set a new production line, the company establishes that increase in costs will be passed on to the customers. More than 80% of the total costs and expenses come from raw materials, and the rest are mostly labor costs. Since most of the costs comes from raw materials that are passed on to the customers through the contracts, it is reasonable to forecast the costs and expenses as a % of revenues. Historically, all the cost of goods sold (COGS) were in the range from 80-90% of net revenues. Likewise, the company selling, general and administrative expenses (SG&A) were in the range from 0,2%-3,4%.

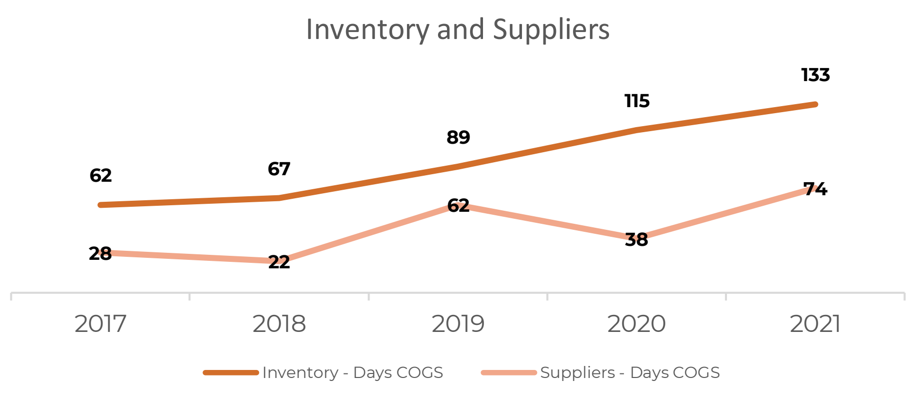
Therefore, for the COGS, it was assumed that the costs as a % of net revenues would be the average from 3 years for 2022, which is reflecting higher costs due to the high inflationary environment, and as the inflation decreases, in 2023, the costs as a % from net revenues will achieve 83,7%, which will increase the gross margin. This value is stabilized for the remaining years. For the SG&A, it was perpetuated as 0.5% of net revenues. In order to calculate the company´s EBITDA Margin, it was added back from the EBIT the depreciation and amortization (D&A), in which the details of the projections will be explained later in this work. The forecasted margins are illustrated below:



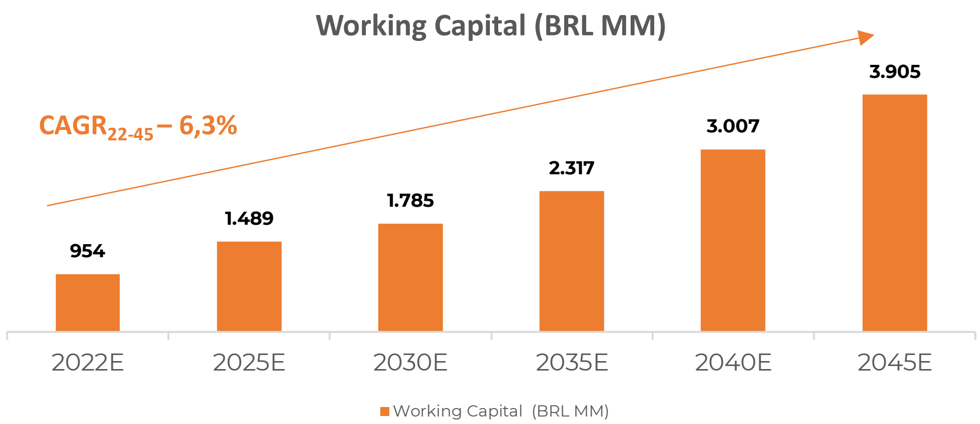
8.2.3 – Working Capital

For all the working capital accounts in Aeris Energia´s balance sheet it was calculated days of net revenues and days of COGS. In the last years, the inventory turnover decreased significantly, and inventories started to be idle for longer. This behavior is explained by the introduction of new production lines with its clients, that requires a period of ramp-up, which lasts by 1-2 years usually. By the maturation of those production lines, the company gets more efficiency and increases in its inventory turnover. Furthermore, strategic inventory was decided to remain idle in order to mitigate the chain rule production risk as a result from the Covid-19 pandemic. Both events reflected in a lower return on invested capital (ROIC) for Aeris Energia.

Likewise, the liabilities with suppliers increased as well, as a result from the organic growth from the business and the increase in the average payment period. The graphic below describes the behavior from the days of inventories and days of suppliers from Aeris Energia in the last years:



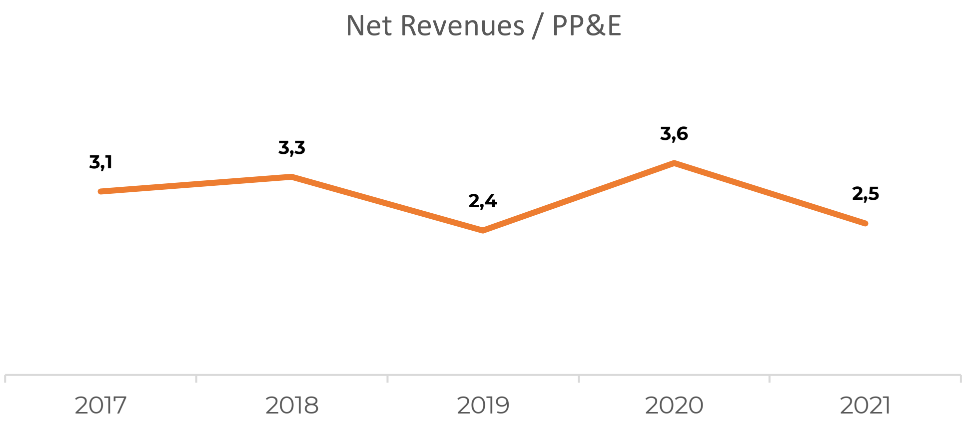
Thus, the working capital accounts were forecasted by taking a five-year average from days of revenues and days of COGS from each account on the working capital. The main accounts which drives the working capital investments are inventories, accounts receivable and suppliers, which were forecasted to reflect the development of new production lines arising from the introduction of new technologies and the demand from the OEMs. The organic growth from Aeris Energia demands more investments in working capital. The forecasted working capital is illustrated below:



8.2.4 – Capital Expenditures and Depreciation

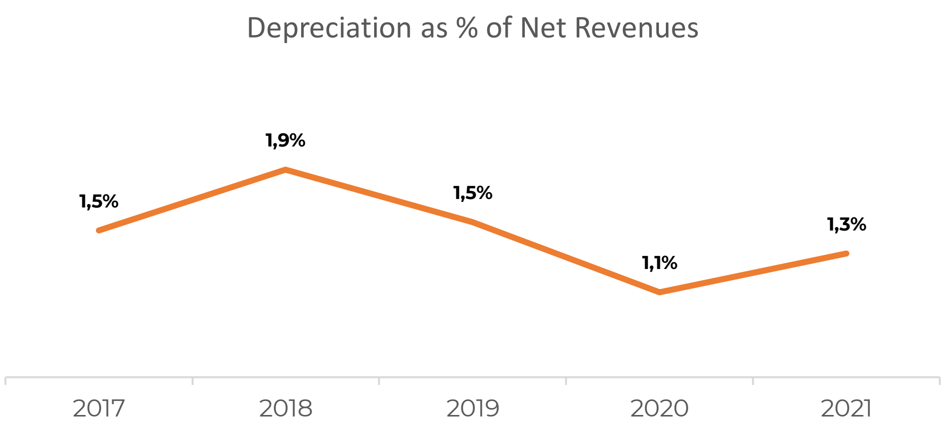
Aeris Energia´s business model involves the expansion of its industrial park located in Porto do Pecém in Ceará in order to meet the demand from its customers and to launch new production lines according to new trends and market solutions. As a result, the historic growth in the size of wind blades, the new technologies adopted, and the increase in the supply contract with its customers demand capital expenditures by Aeris Energia. During its 10 years of history, the company has significantly expanded its production capacity. In 2020, Aeris´s had a structure to manufacture 5.100 wind blades per year, whilst in 2018, this capacity was 2.550 (Company Data).

Therefore, Aeris Energia´s business model is capital intensive. In order to forecast the company´s capital expenditures, it was analyzed how much revenue the company generates for each unit of fixed assets. The behavior found was illustrated below:



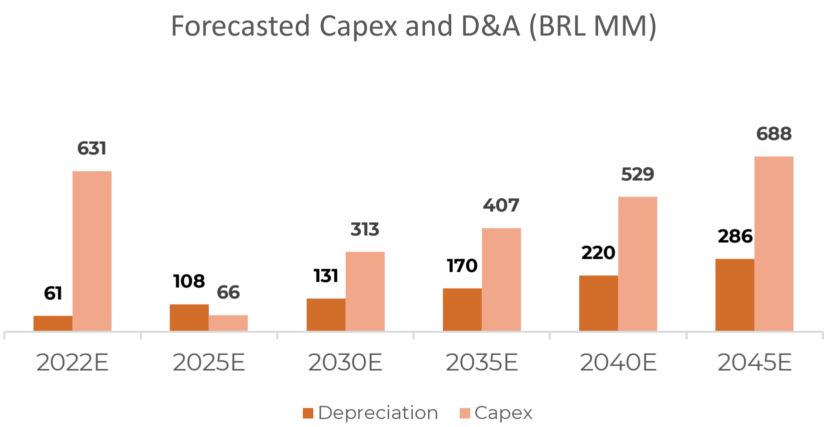
Since Aeris need to expand its productive park to grow organically and to enter larger production contracts with customers, the company delivers a revenue indicator for each unit of property, plant and equipment that does not vary much over the years. Therefore, it is reasonable to forecast net revenues / PP&E as a five-year average, which results in 3 Brazilian reais of revenue per unit of PP&E.

Besides, for the depreciation and amortization (D&A), it was calculated how much was recorded on D&A per Brazilian reais of net revenue generated for the last five years. The following behavior was observed:



Regarding that the company has a constant PP&E per unit of revenue generated, it is appropriate to expect that the amount of depreciation and amortization per unit of revenue generated would also record similar conduct. Hence, it was calculated a five-year average from this indicator, resulting in 1,3%, and it was considered that this ratio would remain constant for the following years.

Having said that, with forecasted depreciation and amortization and the fixed assets, it was possible to arrive at the estimated capex for the coming years:



8.2.5– Free Cash Flow to Firm (FCFF) and Perpetuity

After forecasting the income statement accounts, the working capital, the PP&E, Capex and Depreciation and Amortization until 2045, it was possible to calculate the free cash flow to all the stakeholders from the company. It was considered the Brazilian statutory tax rate of 34% in order to calculate the taxes on EBIT. The summary of the FCFF calculation is illustrated in the table below:

FCFF	2022E	2025E	2030E	2035E	2040E	2045E
EBIT	**598.696**	**1.281.770**	**1.552.914**	**2.012.873**	**2.611.494**	**3.391.066**
(-) taxes	-203.557	-435.802	-527.991	-684.377	-887.908	-1.152.962
NOPLAT	**395.139**	**845.968**	**1.024.923**	**1.328.496**	**1.723.586**	**2.238.103**
(+) Depreciation & Amortization	61.312	108.032	130.885	169.652	220.106	285.811
(+ / -) Var WC	-478.795	-67.448	-92.201	-118.390	-153.226	-199.153
Operational Cash Flow	**-22.343**	**886.553**	**1.063.607**	**1.379.758**	**1.790.466**	**2.324.761**
(-) Capex	-631.449	-66.022	-313.432	-407.165	-529.335	-688.222
FCFF	**-653.792**	**820.530**	**750.176**	**972.593**	**1.261.131**	**1.636.539**

It is expected a positive free cash flow from BRL 821 MM for 2025 and BRL 1.637 MM for 2045. Besides, it is assumed that the business will last forever, and therefore, a perpetuity with growth was calculated. Using the 11,9% WACC calculated, we also assumed a two-stage model, considering the nominal perpetuity growth as 2,5%, which is below the natural rate of Brazilian GDP.

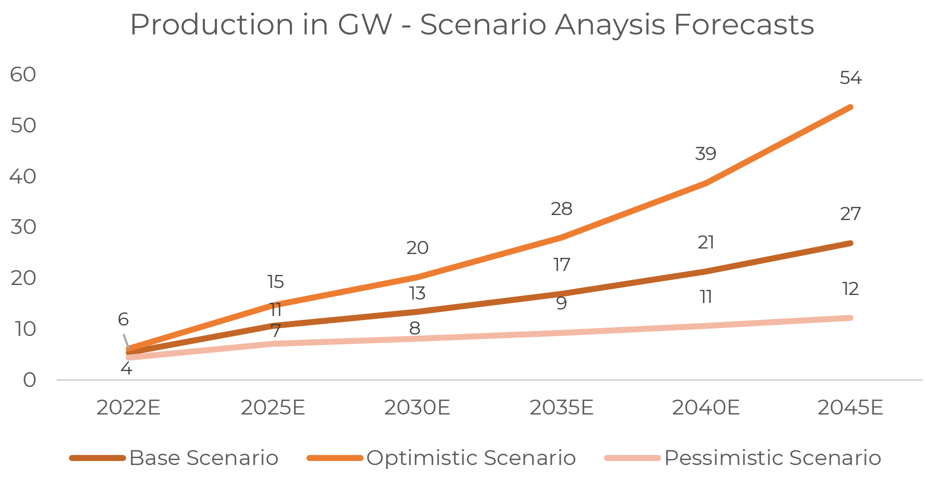
9. Results

Considering the analysis carried out in the section 7 of this essay, which was realized that the equivalent production in MW by the nominal power generation from the wind turbines equipped with the wind blade sets billed from Aeris Energia delivered a similar behavior as the wind energy generation industry in Brazil, it is suggested that Aeris Energia business is significantly affected by the industry growth. However, given that the number of observations was very low, since Aeris Energia is a company that was founded recently and publishes its data only from 2015 onwards, a more complete regression analysis including various controls, that may affect the variable of interest, could not be done.

Despite these limitations, the graphical analysis from 2015 onward suggest that Aeris Energia´s equivalent production in MW delivers a similar behavior as the total wind energy generation in Brazil, and consequently, that the wind energy industry affects Aeris Energia´s results. The sign and significance of the coefficient obtained (+0.491) by the regression of both variables also suggest this positive relationship, in which for each MW generated by the wind energy industry in Brazil, 0.491 MW is generated by the wind turbines equipped with Aeris Energia´s wind blade sets. It is important to emphasize that this estimator is not reliable, and there must be a greater number of observations and the inclusion of other independent variables such as energy generation from other sources, market share, number of competitors, among several other variables that affect this result (must be include in the control of this regression). This is an analysis that will become more credible as Aeris Energia releases new results over time.

Nonetheless, it is reliable to assume by taking this analysis that this equivalent production in MW from Aeris Energia´s wind blades will be affected by the wind energy segment. Since this equivalent production in MW is a driver from the company´s revenues, the intrinsic value from Aeris Energia should be affected by the variation of the wind energy sector. Therefore, this impact can be observed when we adopt a sensitivity analysis according to variations in the equivalent production in MW of Aeris Energia´s wind blades. If the intrinsic value from Aeris Energia, in which will be considered as the equity value and the price per share (obtained by dividing the equity value by the number of shares understanding from the company), varies a lot according to changes in the equivalent production in MW from Aeris Energia, there might be a significant impact from the wind energy generation sector in the company´s intrinsic value, and investors must be aware of the company´s sectoral risk before investing in the company. Although every company is exposed by industry risk, this risk can be much greater for Aeris Energia's intrinsic value, given that much of the company's rise took place amid this industry boom.

Thus, it was considered three scenarios for our analysis: The **base scenario,** which considers the same assumptions described in the section 8 from this essay; The **optimistic scenario,** in which also considers the same assumptions in the previous section, except for the equivalent production in MW in which a more expressive growth was forecasted over time, stemming from higher-than-expected growth in the wind power generation sector; The **pessimistic scenario,** in which also considers the same assumptions in the previous section, except for the equivalent production in MW that a less expressive growth is forecasted over time, stemming from lower-than-expected growth in the wind power generation sector. The equivalent MW production in each scenario can be seen in the chart below:



The base scenario delivers a growth of the equivalent production in GW situated between the two other scenarios and considers the growth assumptions of this variable according to the transmission live of the company's CFO from the first quarter from 2022 results. Since the other assumptions are maintained constant in the three scenarios, according to the description in the section 8 of this essay, and only the equivalent production is changed between scenarios, it is possible to carry out a comparative analysis of how the company's intrinsic value, using the discounted cash flow (DCF) method, is affected by this sensitivity.

The results found are summarized below:

Equity Value - Calculation (BRL MM)	Pessimistic Scenario	Base Scenario	Optimistic Scenario
Enterprise Value	**4.172**	**6.016**	**8.466**
(-) Net Debt	731	731	731
Equity Value	**3.440**	**5.285**	**7.735**
Total Company Shares	**762.552**	**762.552**	**762.552**
Company Intrinsic Value	**4,51**	**6,93**	**10,14**
P/E 2022E	**10,3x**	**14,0x**	**18,9x**
P/E 2023E	**7,1x**	**8,6x**	**10,5x**

As can be observed above, with all the assumptions for the financial model described in the last section for the base scenario, the parameter enterprise value obtained was BRL 6.016 MM. Subtracting the net debt from the enterprise value, we arrive in an equity value of BRL 5.285 MM, which represents an intrinsic value of 6,93 per share of Aeris Energia. This result for the base scenario represents a 2022E Price/Earnings ratio of 14,0x for the net income estimated for 2022, and a 2023E Price/Earnings ratio of 8,6x. Moreover, if the results from the three scenarios are compared, it is possible to identify that that when we vary the equivalent production in MW from Aeris Energia´s wind blades growth assumptions, there is an average impact of 2 billion Brazilian reais in the valuation of the company, and also the intrinsic value per share varies 3 Brazilian reais per share.

The equity value calculated for Aeris Energia in the base scenario is 54% higher than the pessimistic scenario, whilst the equity value in the optimistic scenario is 46% higher than the base scenario. This same magnitude in the variation can be found for the company intrinsic value per share. As expected, there is a significant impact in the Price/Earnings ratios as well.

Since the equivalent production in MW from the wind blades billed from Aeris Energia is a reflection of the number of wind blades sets billed from the company, it affects Aeris Energia´s revenues together with the price per wind blade set. As the price of the wind blade set was forecasted growing inflation (CPI) and a real growth in the early years, the biggest impact comes from the wind blade sets billed. The number of wind blade sets sold by Aeris Energia and the equivalent production in MW is largely impacted by the wind energy generation industry demand, that delivered a high growth recently in Brazil. The wind energy source generation in Brazil represented in 2021 more than 11% of the total energy produced in the country, whereas it represented only 1% of the total electrical production in 2013. This strong growth of the wind energy source pushed the results from the companies acting in the industry up, and largely influenced its intrinsic value.

Despite the fact that the companies are largely affected by the industry they are inserted, there are other variables that also affects its intrinsic values, that must be considered in our analysis. Companies with competitive advantages tend to perform better and have larger valuations than its peers, since it reflects a product or service with highest value and ability to charge higher prices with a lesser inelastic demand. Besides, companies are formed by individuals, and a well-crafted management with experienced executives and a well consolidated board of directors also have a large impact in the company value. Since there is a large impact from the wind energy industry in Aeris Energia, the company can differentiate from its competitors and continue to deliver solid results only by developing competitive advantages and having a well-experienced management with a great internal culture. Therefore, by economic intuition, Aeris Energia is benefiting a lot from the wind energy generation industry growth, and with the development of competitive advantages and from its management, the company can mitigate that significant industry risk that largely impact its intrinsic value.

10. Conclusion

To sum up, there is no doubt that wind energy has gained great relevance in the Brazilian electrical matrix. A country that had 89,6% of its electrical matrix formed by the hydro source in 2001, during the rationing crisis, managed to diversify its electrical mix with the wind source and solar energy growing significantly. For instance, the wind source represented only 1% of the total electrical production in 2013 and in 2021 it came to represent more than 11% of the total generation. Besides, the wind energy generation in 2021 was more than 8 GW of nominal power and more than 1000 wind farms can be found across the country.

Under those circumstances, the company Aeris Energia was founded to meet the demand for outsourcing the production of wind blades by wind turbine manufacturers. Aeris Energia delivered an impressive growth along the last years and reached ~2,5 billion in revenues by offering wind blade manufacturing and services for its short customer portfolio, in addition to inspection and maintenance services in wind farms. This rapid growth casts doubt on investor analysis about its ability to sustain this pace when strong industry growth slows.

Although we cannot draw definitive conclusions from the analysis comparing Aeris Growth in the equivalent production in MW with the wind energy industry growth in MW, due to reduced number of observations made available by Aeris Energia´s results, as expected, the company´s growth delivered a similar behavior as the industry growth. Furthermore, the coefficient estimated by the regressions also suggest this positive relationship. When is sensitized the growth of the equivalent production in MW from Aeris Energia, which is a driver from the company´s revenues, the equity value from the company varies significantly. This sensitivity analysis allows the understanding of how Aeris Energia intrinsic value can be affected by the industry growth.

Those results suggests that my hypothesis that the growth of the wind energy generation industry in Brazil and the share increase in Brazilian electrical matrix was a major determinant of Aeris Energia financial´s growth, and consequently its intrinsic value, was true. The company´s value was significantly driven and is quite sensitive by the industry growth.

Therefore, Aeris Energia should develop consistent competitive advantages, and a culture of excellence with a solid track record of delivering results and cost reductions. The company benefited from strong industry growth and by the herd effect in order to grow its revenues, and there is plenty room for industry growth yet. This position made Aeris Energia as one of the largest companies on it segment, but the long-term sustainable growth will require differentiated services, and diversification of the number of customers, in addition to a well-established governance with experienced directors with complementary skills and a board of directors with well-defined proposals and actions.

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