



EVA (Economic Value Added) analysis

**Brazilian Electricity Sector
2011 - 2016
Executive Summary**

February, 2018

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Objective

Study objective

The objective of this study is to analyze the EVA of the electricity sector in Brazil from 2011 to 2016 and provide insights about the performance of the electricity business segments (generation, transmission and distribution).



EVA: conceptual overview

Why Economic Value Added (EVA)?

- ✓ An estimator for company's economic value creation
- ✓ Focused on shareholder's value creation
- ✓ A good basis for management compensation systems to motivate managers to create shareholder value
- ✓ A tool more useful than rate of return (ROI) in controlling and steering day-to-day operations
- ✓ A concept similar to Economic Profit (EP), Residual Income (RI) and Economic Value Management (EVM)

EVA Basic Premise

- ✓ Managers have a duty to create value in a business / enterprise for their investors
- ✓ Investors make investment decisions in a business based on a return adjusted for risk.
- ✓ Investors can also take its money away from the firm since they have other investment alternatives
- ✓ There is a minimum level of profitability expected from investors, called "capital charge"
- ✓ Capital charge is the average equity return on equity markets
- ✓ Therefore, creating less return (in the long run) than the capital charge is economically not acceptable (especially from shareholders perspective)

What is needed to calculate the EVA?

The following information is required for a company's EVA calculation:

- Income Statement
- Balance Sheet

STEPS:

1. Calculate Net Operating Profit After Tax (NOPAT)
2. Identify company's Capital (C)
3. Determine a reasonable Capital Cost Rate (CCR)
4. Calculate company's Economic Value Added (EVA)

EVA Calculation Steps

EXAMPLE - CONCEPTUAL

STEP1: Calculating NOPAT

| | |
|---------------------------------|-----------------|
| Net Sales | 2,600.00 |
| Cost of Goods Sold | -1,400.00 |
| SG&A Expenses | -400.00 |
| Depreciation | -150.00 |
| <u>Other Operating Expenses</u> | <u>-100.00</u> |
| Operating income | 550.00 |
| <u>Tax (25%)</u> | <u>-140.00</u> |
| NOPAT | 410.00 |

STEP2: Identify company's capital

| | |
|------------------------|-----------------|
| Total Liabilities | 2,350.00 |
| less | |
| Accounts Payable (A\P) | -100.00 |
| Accrued Expenses (A\E) | -250.00 |
| | ----- |
| Capital (C) | 2,000.00 |

EVA Calculation Steps

EXAMPLE - CONCEPTUAL

STEP3: Cost of capital

- Investors will make investment decisions according to alternatives available in the market, such as bonds, stocks, mutual funds.
- Assuming the investor has a minimum acceptable return of 13%.
- Company has $940/2350=40\%$ (or 0.4) of equity with a cost of 13%.
- Company has also 60% debt and assumes that it has to pay 8% interest for it.
- So, the average capital costs would be:
 - CCR ** = Average Equity proportion * Equity cost + Average Debt proportion * Debt cost =
 - $40\% * 13\% + 60\% * 8\% = 10\%$
- CCR depends on current interest level (interest higher, CCR higher) an company's business (company's business more risky, CCR higher).
- If tax savings from interests are included (as they should if we do not want to simplify), then CCR would be: $CCR = 40\% * 13\% + 60\% * 8\% * (1 - \text{tax rate}) = 0.4 * 13\% + 0.6 * 8\% * (1 - 0.4) = 8.08\%$ (Using 40 % tax rate)

STEP4: Calculate EVA

$$\begin{aligned} \text{EVA} &= \text{NOPAT} - C * \text{CCR} \\ &= 410.00 - 2,000.00 * 0.10 \\ &= 210.00 \end{aligned}$$

This company created an EVA of 210.



Selected companies

Selected companies

- We analyzed **52 Brazilian companies** from the electricity sector in the generation, transmission and distribution segments.
- Of this sample, **36 companies were selected** for the EVA calculation. Sixteen companies were excluded from this study because they did not have sufficient financial information or/and it was not possible to segregate electricity sector activities financial data from the company's other activities (i.e. oil & gas).

Selected companies for EVA calculation

| Number of companies selected | | | | | | |
|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Type | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Generation | 10 | 11 | 11 | 11 | 11 | 10 |
| Transmission | 3 | 3 | 3 | 3 | 3 | 3 |
| Distribution | 19 | 19 | 19 | 19 | 19 | 18 |
| Generation & transmission | 3 | 3 | 3 | 3 | 3 | 2 |
| Total | 35 | 36 | 36 | 36 | 36 | 33 |

Generation

1. Eletrobras Chesf
2. Eletrobras Furnas
3. Eletrobras Eletronorte
4. Itaipu
5. Engie Brasil Energia
6. Santo Antônio Energia
7. AES Tietê
8. Duke Energy, Geração Paranapanema
9. Cesp
10. Emae
11. CTEE

Generation & Transmission

1. Eletrobras GT(*)
2. Cemig GT (*)
3. Copel GT (*)

Transmission

1. Isa CTEEP
2. Alupar
3. Taesa

Distribution

1. AES Eletropaulo
2. CPFL Paulista
3. Celpa
4. Cemar
5. Light
6. Coelba
7. Celesc
8. Elektro
9. Celg
10. Celpe
11. Coelce
12. Ampla
13. EDP Bandeirante
14. CPFL Piratininga
15. Energisa Sergipe
16. Energisa Paraíba
17. Energisa Borborema
18. Energisa MG
19. Energisa Nova Friburgo

() Eletrobras, Cemig and Copel do not segregate, in their balance sheet, results from generation and transmission.*

Comparable companies (excluded companies)

Generation

- Norte Energia (Belo Monte)
- Petrobrás
- Rio Paraná Energia
- Energia Sustentável do Brasil (Jirau)
- Eletrobrás Termonuclear
- Companhia Hidrelétrica Teles Pires
- Amazonas Geração e Transmissão de Energia
- Eletrosul

Distribution

- Caiuá
- Vale Paranapanema
- Nacional
- Bragantina
- Força e luz do oeste
- Energisa Tocantins
- Energisa Mato Grosso do Sul
- Energisa Mato Grosso

Although these companies were selected as comparable, they were not included in the EVA calculation due to lack of financial information.

Regarding Petrobras, it was not possible to segregate electricity sector activities financial data from the company's other activities (i.e. oil & gas).

Source: ANEEL, ABRAGE, ABRATE, ABRADÉE, Capital IQ, Factiva, EMIS, company reports, news clips, KPMG analysis



Methodology and assumptions

EVA calculation

1. Calculate Net Operating Profit After Tax (NOPAT)

KPMG compiled data from financial statements of selected industry companies (included in the previous section)

2. Identify company's Capital (C)

KPMG compiled data from financial statements of selected industry companies (included in the previous section)

3. Determine a reasonable Capital Cost Rate (CCR)

KPMG calculated the cost of capital using the CAPM methodology

The spreadsheet (Database for calculation)

| | | | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | | |
|----|-----------------------------------|----------------------|------------------------|------------|------------|-------------|--------------------|----------------------|------------|---------------------------------------|-----------------------|------------|------------|--------------|---|---------|---------|
| | | | Generação | Generation | Generation | Generations | Generations | Generations | Generation | Generation | Generation | Generation | Generation | Generations | Generations | | |
| | | | Eletrobras Eletronorte | Itaipu | Petrobras | CEMIG GT | RIO PARANA ENERGIA | ENGIE BRASIL ENERGIA | Copel GT | Energia Sustentável do Brasil (Jirau) | Santo Antônio Energia | AES Tietê | Parapanema | Termonuclear | Companhia Hidrelétrica Teles Pires Cesp | | |
| 12 | Financial statements basis | | | | | | | | | | | | | | | | |
| 13 | 1 | Assets | R\$ m | 22.744,9 | 37.389,3 | 793.375,0 | 12.378,8 | - | 13.689,6 | 9.766,4 | 22.224,8 | 21.908,9 | 17.673,8 | 3.843,8 | 12.515,1 | 4.596,7 | 14.687, |
| 15 | 2 | Current liabilities | R\$ m | 2.963,3 | 5.116,3 | 82.669,0 | 3.471,4 | - | 1.943,1 | 991,9 | 719,5 | 1.949,1 | 4.548,9 | 388,5 | 1.966,2 | 218,2 | 2.202, |
| 16 | 3 | Shareholder's equity | R\$ m | 13.227,8 | 235,3 | 318.722,0 | 3.486,6 | - | 5.654,9 | 6.484,6 | 7.267,9 | 6.443,9 | 5.902,9 | 1.869,6 | 4.796,5 | 1.731,6 | 8.629, |
| 17 | 4 | Liabilities + equity | R\$ m | 22.744,9 | 37.389,3 | 793.375,0 | 12.378,8 | - | 13.689,6 | 9.766,4 | 22.224,8 | 21.908,9 | 17.673,8 | 3.843,8 | 12.515,1 | 4.596,7 | 14.687, |
| 19 | 5 | Trade payables | R\$ m | 921,1 | 135,2 | 25.924,0 | 369,8 | - | 641,7 | 0 | 247,5 | 1.188,3 | 1.752,9 | 68,5 | 456,4 | 191,8 | 16, |
| 20 | 6 | Accrued expenses | R\$ m | 478,1 | - | 17.119,0 | 246,7 | - | 187,7 | - | - | 185,6 | 781,4 | 64,0 | 63,3 | - | 245, |
| 21 | 7 | Debt | R\$ m | 9.517,9 | 37.154,0 | 482.653,0 | 8.891,4 | - | 7.954,6 | 3.201,6 | 14.906,9 | 15.465,0 | 11.779,9 | 1.974,3 | 7.718,6 | 2.864,1 | 6.050, |
| 23 | 8 | Net sales | R\$ m | 6.046,4 | 6.659,9 | 337.269,0 | 7.714,7 | - | 6.472,5 | 2.946,7 | 732,6 | 2.344,0 | 3.205,0 | 1.223,0 | 1.926,8 | - | 4.699, |
| 24 | 9 | Interest expense | R\$ m | 150,6 | 1.810,6 | 3.093,0 | 381,1 | - | 380,9 | 130,0 | - | 512,1 | 44,3 | 53,6 | - | - | 34, |
| 25 | 10 | Income tax | R\$ m | (845,3) | - | (3.892,0) | 1.116,1 | - | 573,5 | (18,0) | (815,7) | (3,4) | 214,5 | 109,5 | 22,5 | (18,4) | 336, |

Major sources of information

| Sources of information | | |
|-------------------------|---|--|
| Source | Description | Information |
| ANEEL | Governmental energy regulatory agency | Energy sector information |
| Bacen | Brazilian central bank | Macroeconomic data and consensus forecast |
| BNDES | National development bank | Financing and infrastructure projects information |
| EMIS | Emerging markets information agency | Energy sector reports |
| EPE | Energy research institute, conducts studies and planning for ANEEL and the government | Energy sector information and planned matrix evolution |
| IBGE | Brazilian statistics and geography institute | Demographic and national accounts data |
| Oxford economics | Macroeconomic and industry research company | Macroeconomic data and forecast |
| Valor Econômico | Main Brazilian economic and political news carrier | Political analysis and researches |
| Capital IQ | S&P financial platform | Financial data and analysis |

Assumptions for the calculations

- As the industry's participants are not all listed companies, it is not possible to determine their market value indicators and MVA.
- NOPAT was calculated based on the information gathered from financial statements.
- Cost of equity was determined using the CAPM model.
- A distinct cost of equity was used for the three segments of the market evaluated: Generation, Transmission and Distribution
- Risk-free rate for each year was determined as the average yield of Brazilian government bonds.
- Beta coefficient for each year is calculated for the electricity sector using a sample of Brazilian companies market indices.
- For each year, expected market return is calculated using compounded annual growth rate of comparable companies of KPMG's database

Discount Rate Methodology

Discount Rate

- Establishing the discount rate is a fundamental stage of the economic valuation. This single factor reflects aspects of a subjective nature, varying from one investor to another, such as opportunity cost and individual perception of investment risk.

WACC (Weighted Average Cost of Capital)

- The cost of capital for the Company was calculated using the WACC methodology. WACC takes into consideration various financing components, including debt, cost of equity and hybrid bonds used by companies to finance its cash needs. It is calculated according to the following formula:

$$\frac{D}{D+E} \times K_d \times (1-t) + \frac{E}{D+E} \times K_e = \frac{E}{D+E} \times K_e + \frac{D}{D+E} \times K_d = \text{WACC}$$

Weighted Average Cost of Capital

CAPM (Capital Asset Pricing Model)

- The cost of equity for the Company was calculated using the CAPM methodology. Using the CAPM methodology, the cost of equity is calculated according to the following formula:

$$R_f + \beta^* (\text{ERP}) + \text{CRP} + R_s \div (1+I_a) \times (1+I_{br}) = \text{Cost of Equity}$$

$$[\text{Cost of Equity}] \times (1+I_{br}) - 1 = K_e$$

- Rf = Average risk-free return
- β = Beta - specific risk coefficient
- ERP = Market risk premium
- CRP = Country risk
- Rs = Size premium
- Ia = Long-term inflation in the United States
- Ibr = Long-term inflation in Brazil
- D = Total debt
- E = Total equity
- t = Tax rate
- Kd = Cost of debt
- Ke = Cost of equity

Discount Rate Methodology

1) Cost of equity (CAPM or K_e)

Risk-free rate (R_f)

- Free-of-risk rate was obtained by the average earnings of 37-year Brazilian government bonds (T-Bond), historic average of two years (Source: Bloomberg). The period examined for the return of risk free rate is often 2 years in order to eliminate any discrepancies in the average return and estimate the actual expectation of risk.

Inflation adjustment

- The risk free rate calculated is in nominal terms, and as such it is necessary to adjust it for the effects of inflation. We have used as inflation rate the forecasted long term inflation rate in the United States (Source: EIU) and the forecasted long term inflation rate in Brazil. (Source: BACEN).

Market risk premium (ERP)

- As proposed by the KPMG Economic Financial Evaluation Services Technical Committee (VSTC), a single ERP estimate should be used by KPMG appraiser teams for the work. Historic return of T-Bond shares varies from 5%, geometric average, to 7%, arithmetic average. VSTC recommends adoption of 6.0% ERP in all documents. (Source: KPMG VSTC and Damodaran).

Country risk (CRP)

- Until now, own capital cost calculation has been made based on earnings of American companies' shares and American government securities. Accordingly, a "Country Risk Premium" ("CRP") is considered as a required element in capital cost to incorporate additional risks related to investment in the country, which are normally reflected in cash flows.
- In CRP calculation for Brazil, we considered as country risk the Global 37 (2 years) return. Our source was Bloomberg.

Size premium (Rs)

- The size premium ("Rs") represents the additional return required by investors to incur a higher level of risk to be investing in companies with different levels of size.
- We have added to the cost of equity the risk associated with the average market cap of selected companies of the electricity sector, as recommended by studies developed by Duff & Phelps (2016).

Capital Structure

- For beta leveraging purposes, we considered the market capital structure, calculated according to its market cap (Equity used as proxy for market cap) and net debt (total debt less cash and cash and equivalent).

Discount Rate Methodology

2) Cost of debt (Kd)

- The cost of debt was estimated as the average of comparable companies Cost of Debt (after tax), provided by Bloomberg.

3) Beta

- Beta is the specific coefficient of risk of the shares of a company in relation to a market index that adequately represents the stock market as a whole.
- In the case of valuation of companies whose shares are listed and with expressive trading on stock exchanges, the Beta of the share can be calculated by the correlation of its daily returns in relation to the market index.
- The effect of taxes from the country where the companies are located, and sector debt, are excluded from the average Beta, and the unleveraged Beta is obtained.
- The unleveraged beta of the industry is re-leveraged according to: (i) capital structure of the evaluated Company; and (ii) the effective income tax rate.
- The standard practice in the market is to consider global comparable companies in order to calculate the average Beta for the sector since we consider that the portfolio is globally diversified with no barriers to global investment. The comparable companies provided by Bloomberg which we used to calculate the average Beta for the sector.

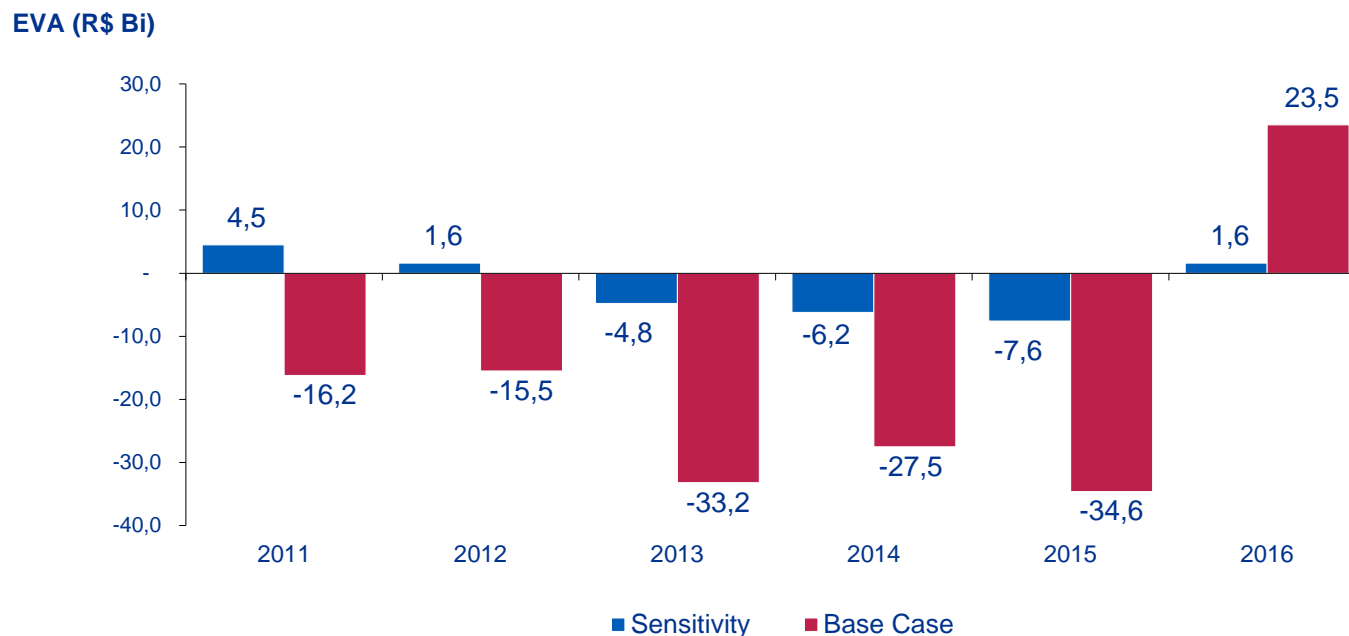


Preliminary EVA results

(2011-2016)

Results Summary - Base and Sensitivity

In the sensitivity analysis we excluded **Eletrobras and its subsidiaries**, since in 2016 the company received non-recurring revenues that generated a 675% increase in NOPAT from 2015 to 2016.



Consolidated EVA (Base): **- R\$ 103,5 Bi**

Consolidated EVA (Sensitivity – without Eletrobras): **- R\$ 10,9 Bi**

Source: ANEEL, ABRAGE, ABRATE, ABRADDEE, Capital IQ, Factiva, EMIS, company reports, news clips, KPMG analysis



Conclusions and Recommendations

Conclusions

The study has determined that the electricity sector presented negative EVA results (value destruction, i.e., the return on invested capital was lower than the cost of capital):

- the consolidated EVA (all segments from 2011 to 2016) was (R\$ 103,5 Bi)
- the consolidated EVA (all segments from 2011 to 2016) excluding Eletrobras and its subsidiaries was (R\$ 10,9 Bi)

Such results confirm the consequences of the causes known by the sector:

- poor government decisions and interventions (MP 579 and its consequences: involuntary under and over contracting for DisCos, GSF and exposure to short term market prices for GenCos, low tariffs for TransCos);
- prolonged drought and delays in the construction of power plants and transmission lines.

The worst years were from 2014 to 2016 and now the sector is showing signs of recovery

Recommendations

- Avoid government intervention
- Increase predictability and allow sector to produce positive (or at least close to zero) EVAs
- Express “real world” conditions in the WACC calculation



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