



ISSN: 2230-9926

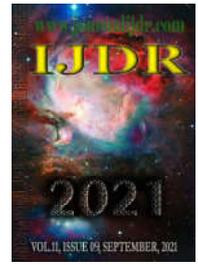
Available online at <http://www.journalijdr.com>

IJDR

International Journal of Development Research

Vol. 11, Issue, 09, pp. 50029-50032, September, 2021

<https://doi.org/10.37118/ijdr.22793.09.2021>



RESEARCH ARTICLE

OPEN ACCESS

GOVERNANCE SYSTEM, PROCESS AUTOMATION AND RISK ANALYSIS OF THE CVA

¹Marcelo Aparecido Pelegrini, ²Adriano Guedes Martins, ³Felipe Ribeiro Miranda, ⁴João Carlos Martins de Carvalho, ⁵Matheus Guarany de Araujo, ⁶Celia Marcia de Souza, ⁷Tiago Santos Gonçalves da Costa and ⁸Ana Carolina Aires Cerqueira Prata

¹Departament of Research and Development, Sinapsis Inovação em Energia, São Paulo, Brasil; ²Manager of Department of Finances and Tariffs, Neoenergia Distribuição Brasília, Brasília, Brazil; ³Department of technology, Research and Innovation, Sinapsis Inovação em Energia, São Paulo, Brasil; ⁴Departament of Research and Development, Sinapsis Inovação em Energia, São Paulo, Brasil; ⁵Departament of Research and Development, Sinapsis Inovação em Energia, São Paulo, Brasil; ⁶Department of Finances and Tariffs, Neoenergia Distribuição Brasília, Brasília, Brazil; ⁷Department of Finances and Tariffs, Neoenergia Distribuição Brasília, Brasília, Brazil; ⁸Prata Department of Finances and Tariffs, Neoenergia Distribuição Brasília, Brasília, Brazil

ARTICLE INFO

Article History:

Received 10th June, 2021
Received in revised form
11th July, 2021
Accepted 24th August, 2021
Published online 27th September, 2021

Key Words:

Keywords: Governance System - CVA - Tariff
Readjustment - Risk Analysis - Process
Automation - Energy Distribution.

*Corresponding author:
Marcelo Aparecido Pelegrini

ABSTRACT

The development of simulation models, that realistically represent the regulatory/ commercial environment in which the company is inserted, is necessary for it to understand the behavior of some variables needed for decision making. In particular, this work intends to focus on the "A" Portion of the Item Variation Account (Conta de Variação de Itens da Parcela "A" – CVA) has shown significant values for the distributors, mainly due to the increased participation of availability contracts in their portfolios and the systemic conditions presented in recent years, with a significant increase in the dispatch of thermal power plants. In some months, CVA values even exceed the company's remuneration through Portion "B". Based on this understanding, this work aims to develop a methodology and tool for the simulation and projection of the CVA in different accounting periods (tariff year, calendar year, month, day and hour) and for different scenarios of systemic conditions, with the calculation of risk metrics and estimating events in the short term market (MCP). To do this, an initial research will be conducted to identify the entire accounting flow and the tariff bases used by ANEEL, in order to identify the factors involved and perform a mathematical modeling of the tariff calculation system. In sequence, with the obtaining of such files through the responsible agents, related to a distribution system operator - in this case, NDB - an import and interpretation structure is created, resulting in a database that will serve as an input to the calculator engine that will carry out the projection of costs associated with CVA.

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Citation: Marcelo Aparecido Pelegrini, Adriano Guedes Martins, Felipe Ribeiro Miranda, João Carlos Martins de Carvalho, Matheus Guarany de Araujo, Celia Marcia de Souza, Tiago Santos Gonçalves da Costa and Ana Carolina Aires Cerqueira Prata, 2021. "Governance system, process automation and risk analysis of the cva", *International Journal of Development Research*, 11, (09), 50029-50032.

INTRODUCTION

Considering a distribution system operator, it is essential for business management and interaction with the regulatory agency (ANEEL) to have a good understanding of the ecosystem of the market that it is contained in. The regulatory framework and trade flows are often complex and are the exclusive responsibility of ANEEL. A prominent item among those under ANEEL's responsibility is the Portion "A" Item Variation Account. CVA has shown significant values for distributors, mainly due to the increased share of availability contracts in their portfolios and the systemic conditions presented in recent years, with a significant increase in the dispatch of thermoelectric

plants. In a few months, the CVA values even exceed the company's remuneration through the Portion "B". Portion "A" of the Required Revenue of the Distributors has a neutral characteristic from the tariff point of view, that is, the distributor does not have additional remuneration with this item. Thus, due to this characteristic, this theme is not commonly addressed in research projects, which leaves ample room for innovations. In this sense, this project seeks to fill a technological "gap" with the development of a robust methodology with scientific bases to carry out the projection of items considered not managed by the distribution system operator. Only this aspect, of using scientific bases for the projection of a financial component that has become extremely relevant for the company's financial management already characterizes the project with originality, but the model will be

even more robust and original, with the use of methods of scenario simulations and risk metrics for evaluating the projection results.

The following products will be provided upon completion of the project:

- a) Methodology for projection of the CVA of Distributors, considering scenarios of components under conditions of uncertainty.
- b) Computational Tool that automates the calculation and projection of the CVA, with respective operating manuals. This tool will also compare the results of the calculation by the company at the end of the period with those actually calculated by ANEEL, pointing out the discrepant items for further discussion.

The results will be calculated for the NDB Base, but the result of the work can be used by all energy distribution operators, increasing the reliability of the calculations performed and using the projections at risk to plan financial disbursements and receive investments.

METHODOLOGY

At first, the main parties and the documents necessary for the modeling are identified, in order to understand the tariff process involved in the creation of portion "A". Then, the public tariff results, resolutions and files provided by NDB that make up the CVA are identified and mapped. With these data in hand, the calculations used in the projection are modeled and a structure for importing and forming the database that serves as an input to this calculation tool is developed. Finally, a simple projection is carried out, which will be complemented with data from the future market so that the results can be compared and calculated.

DEVELOPMENT

Identification of the main parties

The main parties involved in CVA calculations, including the distributor, are:

- NDB: Neoenergia Distribuição Brasília, a mixed economy company, electric energy distribution concessionaire, headquartered in Brasília – DF, has a concession area of 5,780 km², covering the entire Federal District.
- ANEEL: The National Electric Energy Agency - ANEEL, a special regime autarchy linked to the Ministry of Mines and Energy - MME, was created to regulate the Brazilian electricity sector, through Law No. 9,427/1996 and Decree No. 2,335/1997.
- ONS: Established as a legal entity governed by private law, in the form of a non-profit civil association, the National Electric System Operator - ONS was created on August 26, 1998, by Law No. 9,648, with the changes introduced by the Law n° 10.848/2004 and regulated by Decree n° 5.081/2004.
- CCEE: The Electric Energy Commercialization Chamber - CCEE is a non-profit entity that is responsible for enabling and managing the commercialization of electric energy in the country.

Current CVA Regulations

The revenue required from the distribution concessionaires is made up of two installments: Portion "A" and Portion "B".

Portion "A" is called non-manageable costs, because their values, quantities and variation over time are independent of the concessionaire's control or because they refer to legally established charges and taxes.

Portion "B" is called manageable costs, because the distribution operator has full capacity to manage them directly, such as:

administration, operation and maintenance expenses (personnel, material, third-party services, general expenses), depreciation quotas and remuneration of capital.

In a tariff process, regulatory costs are determined by forecast and are subject to variations during the term of the new tariff period. Some costs have a mechanism for capturing deviations between the forecast and the realized value, established by the Interministerial Ordinance PI MF/MME n° 025, of 2002. Thus, during the tariff cycle, the deviations of these costs in relation to the value foreseen in the tariff set at the beginning of each tariff cycle, these are offset in the next tariff process. For the items of Portion "A" a specific accounting account was created, called "Account for Compensation for Variation in Values of Items of Portion "A" - CVA", and sub-accounts related thereto, for the purpose of controlling and recording the respective values and support for the calculation of the readjustment of the electricity supply tariff, whose variation was not included in the tariff.

The CVA is intended to register the variations occurred in the tariff cycle of the regulatory values of the following cost items of Portion "A".

- Contribution to the Energy Development Account (CDE)
- Tariff for the Use of Transmission Facilities Integrating the Basic Network
- Cost of Electric Power Acquisition
- Electricity Transport Tariff from Itaipu
- Energy quotas and cost of the Incentive Program for Alternative Sources of Electric Energy (PROINFA)
- System Service Charges - ESS
- Reserve Energy Charge - ERR
- Compensation Account for Variation in Financial Compensation Values for the Use of Water Resources - CFURH

The CVA reflects the unit cost variation (use of transmission facilities that are part of the Basic Network, transport of energy from Itaipu, transfer of power from Itaipu, financial compensation for the use of water resources and acquisition of electricity) or variation in total cost (CCC, CDE, ESS, Proinfa and financial adjustments arising from the processes of determining actual costs). When the CVA refers to unit cost variations, the balance is calculated by the actual and forecast price differential, applied to the amount associated with the actual month for the respective cost, and when the CVA refers to total cost variations, the balance is calculated by the difference in cost, actual and forecast, of the month for the respective cost. For purposes of calculating the balance, the CVA is divided into two parts: 5th Business Day CVA and Processing CVA.

- The 5th Business Day CVA refers to the difference between the sum of the expenses on the payment dates and the tariff forecast considered in the concessionaire's last approved tariff process, plus the financial remuneration, interest rate Special System for Settlement and Custody - SELIC for the period, up to the 5th business day prior to the date of the tariff process in progress.
- The Processing CVA is obtained by applying the remuneration projected for the period of twelve months on the balance of the 5th business day CVA and its value should be considered as a financial component in the tariff process, according to Interministerial Ordinance PI MF/MME 025, 2002, art. 3rd, §2.

Structure and Composition of the Database: For the creation of the database, three data sources are used primarily: accounting data (involving tariff coverage), official CCEE documents (involving energy and settlement contracts) and market information (comprising the payments that the distributor makes to the basic network transmission companies, power purchase agreements and other charges). For both models, it is necessary to introduce the parties involved in the transaction, besides an environment where interaction between these is possible. The agents involved are:

Accounting: The following files make up the company's accounting data:

- PCAT: Tariff Opening Spreadsheet (ANEEL)
- SAMP: Market Information Monitoring System for Economic Regulation (ANEEL)
- BMP: Standardized Monthly Trial Balance (ANEEL)
- SPARTA: Support for the Annual Tariff Adjustment (ANEEL)

- LFRCGF001: Settlement of Physical Guarantee Quota Regime
- RES005: Reserve Power Adjustments
- LFMCS0.002: Calculation of Financial Settlement of MCS0 EE Assignments – Distributor
- LFMCS0.004: Assignments to be settled by Product MCS0 EE – Assignee
- EC001: Re-accounting

Table 1. Comparison Between the Results of the items that make up the CVA TE for 2019 and 2020

SUB	MODALIDADE	POSTO	MERC.	TE CVA									RESULTADO ANEEL PCAT 2019	DIFERENÇA (ANE-APL)/ANE%
				ENCARGO			ENERGIA		FIO A		PERDAS	SUBTOTAL		
				ESS/E	CDE		ENERGIA REV	ITAIPU	TUST IT.	PERDAS RB	APLICATIVO			
A2	Energia horária	EP	6,047,55	-12,7	-4,34	60,84	0,72	-0,03	0,93	45,47	45,52	0,11%		
		EFP	96,497,21	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
A3a	Energia horária	EP	3,238,76	-12,7	-4,34	60,84	0,72	-0,03	0,93	45,47	45,52	0,11%		
		EFP	31,373,34	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
A4	Energia horária	EP	93,335,02	-12,7	-4,34	60,84	0,72	-0,03	0,93	45,47	45,52	0,11%		
		EFP	945,967,33	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
AS	Energia horária	EP	37,182,88	-12,7	-4,34	60,84	0,72	-0,03	0,93	45,47	45,52	0,11%		
		EFP	384,343,93	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
B1	Energia horária	EP	121,54	-12,7	-4,34	60,84	0,72	-0,03	0,93	45,47	45,52	0,11%		
		EINT	83,68	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
		EFP	1,244,82	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
	Energia convencional	E	2,230,389,56	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	3,044,28	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	6,309,09	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	5,834,72	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	1,988,70	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
	Energia convencional	E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
Energia horária	EP	0,50	-12,7	-4,34	60,84	0,72	-0,03	0,93	45,47	45,52	0,11%			
	EINT	0,29	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%			
	EFP	0,00	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%			
B2	Energia convencional	E	84,093,34	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		EP	0,00	-12,7	-4,34	60,84	0,72	-0,03	0,93	45,47	45,52	0,11%		
		EINT	0,00	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
	Energia horária	EP	0,00	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
		EINT	0,00	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
		EFP	0,00	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%		
	Energia convencional	E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
	Energia convencional	E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
Energia horária	EP	220,61	-12,7	-4,34	60,84	0,72	-0,03	0,93	45,47	45,52	0,11%			
	EINT	170,13	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%			
	EFP	2,778,63	-12,7	-4,34	35,37	0,72	-0,03	0,93	20,00	20,02	0,10%			
B3	Energia convencional	E	1,169,209,88	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		
		E	0,00	-12,7	-4,34	37,50	0,72	-0,03	0,93	22,12	22,15	0,14%		

Marketplace: Market data, referring to charges, payments for the use of the basic network and payments for the distributor's energy contracts are used to generate a monthly XML file, which is sent to ANEEL. This generator xml file consists of:

- PARADIGMA FILES: commercial payment files (distributor)
- AVD FILES: Debit Notices. Accounts of transmission companies operating in the basic network to the distributor (ONS)
- EXPORT_SAP: payment history of distributor (distributor)

In addition, a list of suppliers (distributor) and ANEEL resolutions referring to the amounts used by the distributor for the payment of charges are used.

CCEE: All payments referring to installments are centrally accounted for and settled by the CCEE. These payments are made available in standard reports from the Chamber of Commerce. The list of reports and acronyms are presented in the following documents:

- ARCGF002: Calculation by Physical Guarantee Quota Regime
- ARVEN003: Calculation of Nuclear Energy Sales Sales Revenue
- BDG001 (BEG): Energy Balance
- CSR001: Effects of Contracting by Availability
- CTO001: ACR and ACL contracts

- RRRH001: ACR and Generation Hydrological Risk Transfer
- SUM001: Summary.

Data base

Analyzing the SisCVA application, it is possible to break down the tariff generation process into dozens of calculations involving all the documents mentioned above. To feed these calculations, an import computational structure is developed, which receives each table presented in the described files, identifies the relevant fields for the CVA calculation, and populates an SQL database. This database is the key to the tariff projection, as it represents the accounting foundation behind the excel application used by ANEEL. Due to the dimensions of the conceived import structure, Figure 5 illustrates a flowchart of only one part of the process, which is applied in the formation of the entire base. The image shows the identification and import of market files (described in item 3.3.2, such as SAP, PARADIGMA, AVD, CCEE and ANEEL files), and the population of some tables used in the SisCVA application.

RESULTS

With the formation of the database, the simulator uses the emulated calculations of ANEEL application to determine the CVA values. Table 1 shows the results obtained by the simulation and ANEEL data for the items that make up the TE (Energy Tariff) of the CVA balance,

Table 2. Comparison Between the Results of the items that make up the CVA TUSD for 2019 2020

SUB	MODALIDADE	SUBCLASSE	MERC.	TUSD CVA										RESULTADO ANEEL 2019	DIFERENÇA (ANE-APL)/ANE%		
				TUSD													
				ENCARGO		FIO A		PERDAS	PERDAS	PERDAS	PERDAS	PERDAS	PERDAS			PERDAS	
CDE	PROINFA	TUSD RB	TUST FR	TÉC.	RB	NÃO TÉC.	APLICATIVO	ANEEL	2019	ANEEL	2019	ANEEL	2019	ANEEL	2019		
B	Geração	Não se aplica	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00%	
			0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00%
			121,54	6,33	0,86	-0,49	-0,13	3,93	0,15	1,86	12,50	12,50	12,50	12,50	12,50	0,00%	
B1	Branca	Residencial	83,68	6,33	0,86	-0,29	-0,08	3,93	0,15	1,86	12,75	12,75	12,75	12,75	0,00%		
			1.244,82	6,33	0,86	-0,10	-0,03	3,93	0,15	1,86	12,99	13,00	13,00	13,00	0,08%		
			2.230.389,56	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%		
	Convencional	Residencial baixa re	3.044,28	0,00	0,00	-0,17	-0,05	3,93	0,15	1,86	5,72	5,72	5,72	5,72	0,00%		
			6.309,09	0,00	0,00	-0,17	-0,05	3,93	0,15	1,86	5,72	5,72	5,72	5,72	0,00%		
			5.834,72	0,00	0,00	-0,17	-0,05	3,93	0,15	1,86	5,72	5,72	5,72	5,72	0,00%		
		Residencial baixa re	1.988,70	0,00	0,00	-0,17	-0,05	3,93	0,15	1,86	5,72	5,72	5,72	5,72	0,00%		
			0,00	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%		
			0,00	0,00	0,00	-0,17	-0,05	3,93	0,15	1,86	5,72	5,72	5,72	5,72	0,00%		
	Convencional	Residencial baixa re	0,00	0,00	0,00	-0,17	-0,05	3,93	0,15	1,86	5,72	5,72	5,72	5,72	0,00%		
			0,00	0,00	0,00	-0,17	-0,05	3,93	0,15	1,86	5,72	5,72	5,72	5,72	0,00%		
			0,00	0,00	0,00	-0,17	-0,05	3,93	0,15	1,86	5,72	5,72	5,72	5,72	0,00%		
B2	Branca	Não se aplica	0,50	6,33	0,86	-0,55	-0,15	3,93	0,15	1,86	12,42	12,42	12,42	12,42	0,00%		
			0,29	6,33	0,86	-0,33	-0,09	3,93	0,15	1,86	12,70	12,71	12,71	12,71	0,08%		
			0,00	6,33	0,86	-0,11	-0,03	3,93	0,15	1,86	12,98	12,99	12,99	12,99	0,08%		
	Convencional	Não se aplica	84.093,34	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%		
			0,00	6,33	0,86	-0,55	-0,15	3,93	0,15	1,86	12,42	12,42	12,42	12,42	0,00%		
			0,00	6,33	0,86	-0,33	-0,09	3,93	0,15	1,86	12,70	12,71	12,71	12,71	0,08%		
	Convencional	Cooperativa de elet	0,00	6,33	0,86	-0,11	-0,03	3,93	0,15	1,86	12,98	12,99	12,99	12,99	0,08%		
			0,00	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%		
			0,00	6,33	0,86	-0,55	-0,15	3,93	0,15	1,86	12,42	12,42	12,42	12,42	0,00%		
		Branca	Serviço público de il	0,00	6,33	0,86	-0,33	-0,09	3,93	0,15	1,86	12,70	12,71	12,71	12,71	0,08%	
				0,00	6,33	0,86	-0,11	-0,03	3,93	0,15	1,86	12,98	12,99	12,99	12,99	0,08%	
				0,00	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%	
Convencional	Serviço público de il	0,00	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%			
		0,00	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%			
		0,00	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%			
B3	Branca	Não se aplica	220,61	6,33	0,86	-0,55	-0,15	3,93	0,15	1,86	12,42	12,42	12,42	12,42	0,00%		
			170,13	6,33	0,86	-0,33	-0,09	3,93	0,15	1,86	12,70	12,71	12,71	12,71	0,08%		
			2.778,63	6,33	0,86	-0,11	-0,03	3,93	0,15	1,86	12,98	12,99	12,99	12,99	0,08%		
	Convencional	Não se aplica	1.163.209,88	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%		
			0,00	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%		
			0,00	6,33	0,86	-0,17	-0,05	3,93	0,15	1,86	12,90	12,91	12,91	12,91	0,08%		
B4	Convencional	Iluminação pública	446.867,09	3,48	0,47	-0,09	-0,03	2,16	0,08	1,02	7,10	7,10	7,10	7,10	0,00%		
			0,00	3,80	0,51	-0,10	-0,03	2,36	0,09	1,11	7,74	7,74	7,74	7,74	0,00%		

while Table 2 presents the same comparison, but for the TUSD (Use Tariff) tariff Distribution System) of the CVA balance. For 54% of the Portion A items, the TUSD CVA tariff values (Table 1) for providing the 2019 readjustment calculated by the application did not differ from those calculated by ANEEL in file 5160_PCAT_CEB-DIS_2019, and for 46% the differences were from 0.01 R\$/kW or 0.01 R\$/MWh, positive or negative. The TE CVA tariffs (Table 2) for providing the 2019 readjustment calculated by ANEEL presented values 0.11% or 0.12% higher than those calculated by the application.

CONCLUSIONS

Thus, the creation of a database that aggregates all accounting items is necessary for the calculation of Portion A, identifying which are the relevant data sources and the way to aggregate them for its construction. This base will include all accounting files related to tariff coverage, payments and contracts with the Electric Energy Commercialization Chamber. The tools developed serves to calculate the CVA and validate the projections made, providing an environment that realistically represents the regulatory/commercial environment in which the company operates. For the future, it is expected that with the completeness of the files, and adding more periods and more distribution concessionaires, it will be possible to refine the

algorithm and the import structures, in order to become more comprehensive. The implementation of a dashboard suitable for interaction with the database and presentation of results is also planned, capable of making queries to the bank and presenting the results directly.

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