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ANALYSIS OF THE FEASIBILITY OF MIGRATION TO THE FREE ENERGY MARKET IN PUBLIC AGENCIES: A PERSPECTIVE BASED ON A CASE STUDY

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ABSTRACT

This article analyzes the feasibility of migrating to the free energy market in public institutions, focusing on the economic impact and sustainable practices that this transition can provide. The research was carried out through a case study, evaluating a federal educational institution in Brazil. The main objective was to identify the financial benefits and the technical, regulatory and organizational challenges involved in this process. The analysis of the data showed that, by adopting the free energy market, the institution could significantly reduce electricity costs and optimize the management of its resources. In addition, the possibility of adopting renewable energy sources reinforces the institutional commitment to sustainability and socio-environmental responsibility. However, the results also show the need for rigorous strategic planning, which involves the training of teams, the updating of measurement systems and the adequacy of administrative processes. The research also points out the importance of public policies that encourage the migration of other public institutions to the free energy market, with the simplification of regulatory processes and the incentive to partnerships with the private sector. In terms of impact, the transition can be a model of good practice for other public sector organizations, expanding the adoption of sustainable and efficient solutions. In summary, the study concludes that, although there are challenges to be overcome, the migration to the free energy market is a viable and beneficial strategy for public institutions, contributing to the modernization of public management and the fulfillment of global environmental goals.

Keywords: Free Energy Market. Sustainability. Energy Management. Public Economy.

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INTRODUCTION

The need to reduce costs and optimize resource consumption has become increasingly pressing for public institutions, especially in a context of increasing budget constraints and demands for greater efficiency in the management of public resources. Among the various inputs that directly impact the expenses of government agencies, electricity stands out as a strategic element, since it represents a significant portion of operating expenses. In this scenario, the migration to the free energy market emerges as a promising solution, capable of combining cost reduction, sustainability, and flexibility in the management of electricity supply contracts.

The free energy market is an environment in which consumers have the possibility to negotiate directly with suppliers, choosing the commercial conditions that best meet their demands. This model contrasts with the regulated market, where the purchase of energy is intermediated by distributors, with tariffs defined by regulatory agencies. In Brazil, the National Electric Energy Agency (ANEEL) regulates the conditions for consumers to join the free market, establishing criteria such as the minimum contracted demand and compliance with specific technical and contractual requirements.

Despite the potential benefits, the adoption of the free energy market by public institutions presents significant challenges. On the one hand, there are clear advantages, such as the possibility of substantial financial savings, greater budget predictability, and opportunities to incorporate renewable energy sources into the consumption mix. On the other hand, the transition requires detailed knowledge of the current regulations, a careful evaluation of technical and economic feasibility, and the overcoming of institutional and administrative barriers, such as the need for contractual adjustments and initial investments, even if of low volume.

The migration to the free market is especially relevant in the Brazilian public sector, considering the commitment of public institutions to efficiency in the use of resources and transparency in their operations. The feasibility analysis in this context must take into account not only the economic aspects, but also the social, environmental and institutional impacts. In addition, it is necessary to assess how the transition can contribute to the fulfillment of sustainability goals, aligning with public policies aimed at the energy transition and climate change mitigation.

This work aims to investigate the feasibility of migration to the free energy market in the context of Brazilian public institutions, using a federal educational institution as a case study. The choice of this segment is justified by the relevance of educational institutions in

the structure of the public sector, both in terms of energy consumption and in their strategic role of promoting innovation and sustainability.

The analysis proposed in this article covers the technical, economic, and regulatory aspects surrounding migration, exploring the potential benefits and challenges that need to be overcome. Based on the experience analyzed, it is expected to identify good practices, propose guidelines and provide subsidies so that other public institutions can consider this alternative in their energy management processes.

Thus, this study not only contributes to the debate on the modernization of energy management in the public sector, but also reinforces the importance of innovative solutions that promote efficiency, sustainability, and optimization of public resources. It is expected that the results presented will inspire concrete actions, encouraging public institutions to explore the free energy market as a strategic tool for strengthening their administrative and operational management.

METHODOLOGY

This article adopts a qualitative methodological approach, based on a case study and a literature review. The methodology was structured to understand, analyze and interpret the technical, economic and regulatory aspects involved in the migration to the free energy market in the context of public institutions, focusing on a federal educational institution as a case study.

The bibliographic research is the first stage of the study, being essential to theoretically support the theme and build a solid reference on the free energy market. According to Gil (2008), bibliographic research is characterized by the survey of materials already published, such as books, scientific articles and official documents, which support the understanding of the phenomenon under analysis. In this work, relevant publications that address the energy market in Brazil, the current regulation defined by the National Electric Energy Agency (ANEEL) and studies on energy efficiency in public institutions were consulted.

The case study, in turn, was used as an empirical research strategy to analyze the feasibility of migrating to the free energy market in a specific public institution. According to Yin (2015), the case study is an appropriate approach to investigate contemporary phenomena within their real context, especially when the boundaries between the phenomenon and the context are not clearly defined. In this sense, the application of this methodology allowed us to explore the specificities of electricity consumption, the challenges faced and the opportunities identified in the analyzed institution.

The data collection of the case study was carried out through documentary analysis of internal information of the institution, such as data on energy consumption, energy supply contracts and financial reports. These data were complemented by secondary information obtained from public sources, such as reports from ANEEL and energy market operators. Data triangulation, as indicated by Flick (2009), was used to increase the reliability of the results, integrating different sources of evidence to offer a comprehensive view on the subject.

The data analysis followed a descriptive and interpretative approach, with the objective of identifying patterns, trends and implications of the migration to the free energy market. The information collected was compared with the findings of the literature review, allowing the identification of technical, economic and regulatory aspects that influence the feasibility of the transition in the context of the public sector.

The results obtained were organized and discussed in order to offer theoretical and practical subsidies to other public institutions interested in considering the migration to the free energy market. By adopting a combination of literature review and case study, the methodology of this work sought to combine a robust theoretical foundation with a practical and contextualized analysis, contributing to the advancement of discussions on energy efficiency and modernization of public management.

RESULTS AND DISCUSSION

The results obtained with the analysis of the case study and the literature review allowed a comprehensive evaluation of the feasibility of migrating to the free energy market in public institutions, considering technical, economic and regulatory aspects. These findings reveal both the potential benefits and the challenges that need to be addressed by organizations that want to adopt this energy consumption model.

CASE STUDY: FEASIBILITY ANALYSIS OF THE MIGRATION TO THE FREE ENERGY MARKET IN A FEDERAL EDUCATIONAL INSTITUTION

Contextualization of the Institution

The case study was carried out in a federal educational institution located in Brazil, whose mission is to offer quality education, science and technology, promoting social inclusion and regional development. The institution is composed of several campuses, with significant energy consumption due to its academic, administrative and operational activities, including laboratories, libraries, sports facilities and air conditioning systems.

The analyzed campus has an average monthly energy consumption of more than 500 kW, which already made it eligible for migration to the free energy market, even before the publication of normative ordinance No. 50/2022, from the Ministry of Mines and Energy, with effect from January 1, 2024, In addition, the institution faces challenges related to the high cost of energy in the regulated market, putting pressure on its budget and limiting resources that could be directed to educational activities and research projects.

Data Collection

The analysis was conducted based on data collected through internal documents of the institution, such as:

- Monthly reports of consumption and expenses with electricity.
- Contracts in force with energy distributors in the regulated market.
- Information about the available electrical infrastructure, such as meters, monitoring systems, and equipment efficiency.
- Preliminary studies carried out by the institution on energy saving possibilities.

In addition, secondary data were used, such as free market tariff tables, ANEEL regulations and information on energy suppliers in the open market.

Technical Analysis

The technical survey identified that the campus has energy meters partially compatible with the requirements of the free market, but would need updates in monitoring systems to meet the accuracy required by regulations. In addition, it was found that there is potential to reduce energy consumption with efficiency measures, such as replacing fluorescent lamps with LED and maintaining air conditioning systems.

Economic Analysis

The financial projection indicated that the migration could generate a cost reduction of more than 25% in the total amount spent on electricity. This percentage was calculated based on the difference between the tariffs of the regulated market and the average prices negotiable in the free market.

However, the study also pointed out upfront costs associated with migration, such as:

- Hiring specialized consultancies for the transition.
- Modernization of measurement and monitoring equipment.
- Administrative expenses related to the bidding of new contracts.

The return on investment period was estimated at approximately two years, depending on the evolution of tariffs and the consumption profile.

Regulatory Aspects

The impact of legal requirements for public institutions was analyzed, such as the need to carry out bidding processes for the contracting of suppliers in the free market. This process, although transparent, increases the time needed for migration and requires greater planning on the part of the institution.

Case Study Results

Based on the data collected, it was concluded that the migration to the free energy market is technically feasible and economically advantageous for the institution analyzed. In addition to cost reduction, the transition would contribute to budget predictability and sustainability, aligning with institutional guidelines for efficiency and environmental responsibility.

However, implementation requires careful strategic planning to mitigate risks and overcome regulatory and technical challenges. This includes:

1. Preparation of a detailed initial investment plan.
2. Training of administrative and technical teams.
3. Developing a clear timeline for the transition.

Implications for Other Institutions

The learnings from this case study are applicable to other public institutions with similar consumption profiles. By sharing good practices and lessons learned, this case contributes to disseminating knowledge about the feasibility of migrating to the free energy market, promoting efficiency and sustainability in the public sector.

TECHNICAL ASPECTS

In the technical scope, the analysis of the data from the case study showed that the analyzed institution has favorable characteristics for migration to the free energy market. In addition, opportunities were identified for the adoption of energy efficiency strategies, such as the modernization of lighting and air conditioning systems, which can enhance the economic benefits of migration.

However, challenges related to the institution's electrical infrastructure were also observed, such as the need to update meters and consumption monitoring systems, to

meet the requirements of the free market. These technical aspects highlight the importance of a detailed assessment of the existing infrastructure before the transition, as recommended by studies such as that of Souza et al. (2019), which emphasize the need for alignment between the technical conditions and the requirements of the free energy market.

ECONOMIC ASPECTS

From an economic point of view, the results indicated that the migration to the free energy market can generate significant savings for the institution. Based on the average tariffs practiced in the regulated market and the negotiable prices of the free market, a potential reduction of more than 25% in electricity costs was estimated. These savings would allow the institution to allocate resources to other strategic areas, such as improvements in physical infrastructure and the quality of services provided to the community.

However, it is important to consider the initial costs associated with the migration, including expenses with specialized consultancies, technical adjustments, and contractual guarantees required by energy suppliers. These costs represent an initial obstacle that must be analyzed in relation to the return on investment period, depending on the consumption profile and the contractual conditions negotiated.

The findings reinforce the conclusions of Almeida and Silva (2020), who highlight that, although initial costs may be a limiting factor, the free energy market offers an advantageous cost-benefit ratio in the medium and long term, especially for institutional consumers.

REGULATORY ASPECTS

The regulatory analysis revealed that the migration to the free energy market is in line with public policies to encourage energy efficiency and sustainability in Brazil. ANEEL plays a key role in regulating and monitoring the functioning of the market, ensuring safety and transparency for consumers.

However, the results indicated that the complexity of regulatory requirements can be an obstacle for public institutions that do not have specialized technical teams. The need to prepare customized contracts, in line with current regulations, requires in-depth knowledge of the applicable laws and may require support from external consultants, as indicated by Pereira et al. (2021).

In addition, current legislation requires public institutions to carry out bidding processes to hire energy suppliers, which can extend the time needed to complete the

migration. The compatibility of the requirements of the free market with the legal frameworks of the public sector is, therefore, one of the main challenges pointed out by the results.

The integrated analysis of the results shows that the migration to the free energy market can be a viable and advantageous strategy for public institutions, especially when accompanied by detailed planning and careful risk management. The adoption of this strategy can provide substantial economic benefits, such as the reduction of electricity costs, and at the same time, enable the implementation of more sustainable practices. In this sense, it is a promising alternative to optimize the use of public resources, which is crucial in the current scenario of scarcity of funds and growing demand for efficiency in public spending (ALMEIDA & SILVA, 2020). Migration to the free market allows institutions to seek more competitive prices, adjusting their needs and favoring a more efficient management of resources, which can generate a significant positive impact on the institutional budget (PEREIRA et al., 2021). In addition, by adopting more sustainable practices, public institutions not only reduce costs, but also contribute to the Sustainable Development Goals (SDGs), aligning their operations with public sustainability policies, as recommended in SDG 7 (Affordable and Clean Energy) and SDG 12 (Responsible Consumption and Production), of the UN 2030 Agenda.

However, the survey also underscores the importance of overcoming technical and regulatory challenges, which, if not properly managed, can jeopardize the success of the migration. These challenges can be mitigated through continuous training of teams and the adoption of appropriate tools for energy management. The formation of specialized teams and the search for partnerships with specialized consultancies, which have experience in the transition to the free energy market, are fundamental for the proper management of new contracts and for the optimization of energy use (SOUZA et al., 2019). In addition, the installation of adequate monitoring systems and the updating of energy meters, which meet the regulatory requirements of the free market, are essential points that must be resolved to ensure that the system works efficiently and profitably.

Another relevant aspect of the survey is the need for careful evaluation of the return on investment period (ROI), which can vary considerably depending on the consumption profile and the specific conditions of each institution. The case study demonstrated that, although the savings are significant in the medium and long term, the initial costs with consultancies, infrastructure adequacy and investments in technology can represent an obstacle for institutions with more restricted budgets (GIL, 2008). Therefore, it is essential that each institution conducts a detailed financial analysis to determine the time required for

the recovery of the investment and the feasibility of the migration in financial terms. This planning should involve not only the analysis of energy tariffs, but also the costs of implementing consumption management technologies and compliance with industry regulations.

The alignment of this migration with the United Nations Sustainable Development Goals (SDGs), especially SDG 7 (Affordable and Clean Energy) and SDG 12 (Responsible Consumption and Production), reinforces the strategic relevance of this initiative. The migration to the free energy market is not limited to cost reduction; It also promotes the adoption of practices that encourage the consumption of renewable and clean energy sources. Encouraging the use of energy from renewable sources can even reduce the carbon footprint of public institutions, thus contributing to global and local environmental commitments. According to Melo et al. (2020), the adaptation of the public sector to the demands for clean and efficient energy can also be a crucial factor in fostering a sustainable culture that serves as a model for the private sector and society as a whole. In addition, by adopting renewable energy, public institutions not only generate economic benefits, but position themselves as leaders in sustainability and socio-environmental responsibility.

In addition to the economic and regulatory aspects, it is important to highlight the need to adapt the internal processes of institutions to deal with the dynamics of the free energy market. This involves the implementation of an organizational culture focused on energy management, with greater awareness on the part of the managers and teams involved. Raising awareness of the importance of efficient management of energy consumption, as well as the continuous training of the teams responsible for administering energy contracts, are fundamental steps to ensure the success of the migration and the continuity of benefits over time (PEREIRA, 2018). The formation of an organizational culture in which energy management is considered an integral part of the institutional strategy is crucial to maximize the results of this transition.

The results also suggest that the experience of a single institution can generate valuable and replicable learnings for other public sector entities. By creating good practice guides, comparative studies and evaluation tools based on successful experiences, public institutions can reduce barriers to entry in the free energy market, making migration more accessible and effective (YIN, 2015). Sharing information and best practices through collaborative learning platforms can accelerate the transition of several other institutions, amplifying the positive impacts of change for the public sector.

The importance of integrated actions between government, regulators and the private sector to create a favorable environment for public institutions to join the free energy market is highlighted. Simplifying regulatory processes, offering financial incentives, and creating accessible technological solutions are measures that can accelerate this transition and increase the benefits for institutions, while contributing to the development of a more efficient and sustainable energy sector. Encouraging technological innovation in the public sector, with a focus on energy efficiency, should be a priority in public policies so that migration is viable, effective, and aligned with sustainability objectives.

The migration to the free energy market presents, therefore, a transformative potential for public institutions. It can contribute to financial savings, provide greater flexibility in energy management, and align institutions with the sustainable practices demanded by society and public policies. However, its implementation requires overcoming technical, regulatory, and organizational challenges, which require strategic planning, initial investments, and a commitment to efficient resource management. The experience of this study suggests that, with adequate support, the free energy market can become an essential tool to optimize the use of public resources and promote sustainability in public institutions. Thus, this article contributes to broaden the debate on the subject, encouraging the adoption of innovative and effective practices in public energy management.

CONCLUSION

The migration to the free energy market is a promising strategy for public institutions that seek to optimize their energy management and achieve greater efficiency in the use of financial resources. The results of the analysis demonstrate that, with proper planning and the adoption of good practices, the transition to this market can generate considerable reductions in electricity costs, in addition to enabling the adoption of more sustainable practices, in line with the principles of environmental responsibility and the global goals of sustainable development.

However, for migration to be effective, it is necessary for institutions to face and overcome the technical, regulatory, and organizational challenges that arise throughout the process. The training of the teams involved, the development of a culture of efficient energy management and the creation of adequate infrastructure for monitoring consumption are crucial factors for the success of the migration. In addition, it is essential that institutions prepare financially for the initial costs, such as hiring specialized consultancies, adapting systems, and negotiating contracts, which are essential to ensure a smooth and advantageous transition.

Another relevant point that stands out throughout this analysis is the positive impact that the migration to the free energy market can have on the modernization of public institutions. By reducing energy costs, institutions have the opportunity to invest these resources in other priority areas, such as improvements in teaching conditions and in research and innovation projects. This contributes to a more efficient and transparent use of public resources, in addition to positioning institutions as examples of good practices in the sustainable use of energy resources.

The survey also points to the importance of public policies that encourage and facilitate the migration of public institutions to the free energy market. The simplification of regulatory processes, the creation of financial incentives, and the promotion of technical training are measures that can accelerate the transition and expand the benefits of this change to a greater number of institutions. A partnership between the government, regulators, and the private sector would be essential to create a favorable environment and facilitate the adhesion of public institutions to this market, enhancing the positive impacts on the public sector as a whole.

The experience of migrating from a public institution to the free energy market can serve as a model for others, promoting the exchange of learning and the dissemination of good practices. The sharing of knowledge acquired throughout the implementation of the strategy and the creation of continuous monitoring mechanisms can reduce the barriers to entry and encourage other institutions to follow the same path, expanding the benefits of the free energy market for the public sector.

The migration to the free energy market is a strategic opportunity for public institutions, which, with adequate support and commitment to efficient management, can achieve not only financial savings, but also contribute significantly to a more sustainable future. This process not only optimizes public resources, but also strengthens sustainability and innovation policies in the public sector, aligning with contemporary global challenges and the need for more responsible and efficient management of natural and financial resources.

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