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Marketing Energético B2b Aplicado A La Comercialización Hidroeléctrica En Panamá: Análisis Comparativo Entre Ppa, Licitaciones Y Mercado Spot

B2b Energy Marketing Applied To Hydropower Commercialization In Panama: A Comparative Analysis Of Ppas, Tenders, And The Spot Market

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Resumen

El presente estudio analiza la comercialización de energía hidroeléctrica en Panamá desde una perspectiva de marketing energético B2B, con énfasis en cómo la percepción de valor, el riesgo hidrológico y la estabilidad financiera influyen en la elección entre Power Purchase Agreements (PPA), licitaciones reguladas y mercado spot. A diferencia del enfoque técnico tradicional, la investigación aborda estos mecanismos como productos diferenciados dentro de un portafolio comercial, donde cada uno posee atributos comparables a una propuesta de valor: seguridad, transparencia, flexibilidad o rendimiento especulativo. El estudio adopta un diseño descriptivo–analítico y no experimental sustentado en revisión normativa (ASEP), documentación técnica del Centro Nacional de Despacho y series estadísticas de precios y generación (2015–2024). El análisis revela que los PPA se comportan como un producto premium orientado a compradores institucionales con bajo apetito de riesgo, mientras que las licitaciones funcionan como un esquema competitivo que refuerza credibilidad, aunque con márgenes contractuales más limitados. El mercado spot, por su parte, se posiciona como un producto de alto riesgo y alta oportunidad, capaz de ampliar ingresos en periodos húmedos, pero inestable en escenarios secos. A partir de estos hallazgos se propone una matriz estratégica que permite segmentar compradores según su tolerancia al riesgo y seleccionar el mecanismo comercial más adecuado. Esta visión permite comprender la energía no solo como un recurso físico, sino como un bien transable cuya venta requiere posicionamiento, diferenciación y estrategia comercial basada en marketing energético.

Palabras clave: Marketing energético B2B; Comercialización hidroeléctrica; Power Purchase Agreements (PPA); Mercado spot; Licitaciones reguladas.

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Abstract

This study examines hydropower commercialization in Panama through a B2B energy marketing lens, emphasizing how value perception, hydrological risk and financial stability shape institutional buyers' preferences between Power Purchase Agreements (PPAs), regulated tenders and the spot market. Unlike conventional technical analyses, this research treats commercialization mechanisms as market products with distinct value propositions, comparable to a commercial portfolio: PPAs as premium contracts offering stability, tenders as competitive credibility instruments, and spot sales as high-risk, high-opportunity positions for buyers with greater tolerance to volatility. A descriptive–analytical, non-experimental methodology was applied, supported by regulatory review (ASEP), operational records from the National Dispatch Center, and historical price and generation time-series from 2015–2024. Results indicate that PPAs behave as a low-volatility financial products preferred by institutions seeking predictable long-term cash flows. Regulated tenders reinforce transparency and comparability but offer reduced contractual flexibility. Meanwhile, the spot market operates as a speculative product whose value rises significantly under wet conditions yet exposes producers to major revenue losses during dry periods. Based on these findings, a strategic positioning matrix is proposed to segment buyers by risk tolerance and guide commercial decision-making in hydropower sales. This approach reframes energy from a purely operational commodity into a marketed product, whose success depends on perception, differentiation, and strategic value communication. The study contributes a marketing-oriented framework for commercial planning, risk segmentation and buyer–contract alignment in Panama's hydroelectric market.

Keywords: B2B energy marketing; Hydropower commercialization; Power Purchase Agreements (PPAs); Spot market; Regulated tenders

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Introduction

Hydropower represents the historical core of Panama's electricity matrix and has maintained a sustainable participation above 55% annually over the last two decades (ETESA, 2023). However, the sector's behavior has ceased to depend exclusively on technical generation variables and is now governed by commercial dynamics, value perception, and positioning strategies in a market increasingly sensitive to risk, sustainability, and transparency.

In other words, selling energy is no longer a transactional act: it is a B2B energy marketing process, where the contractual choice is associated with reputation, stability, competitive differentiation, and informed corporate decision-making (Kotler & Keller, 2022; Belz & Peattie, 2018).

Three commercial energy products converge in Panama:

PPA as a premium product, based on financial certainty, supply security, and a promise of long-term stability (Joskow, 2008).

Energy from regulated tenders, associated with the attribute of transparency, competitive comparison, and public validation (ASEP, 2022)

Spot energy as a high-risk–high-return product, whose value is determined by opportunity, seasonality, and hydrological volatility (Pérez-Arriaga, 2013; IRENA, 2019)

Each mechanism, more than a contractual scheme, functions as a differentiated offer within an energy marketing portfolio. PPAs behave as a stable financial service with low annual variance ($< 5 \%$), demanded by risk-averse companies. Tenders act as competitive showcases that build institutional trust[32]. The spot market, conversely, is positioned as a speculative product capable of maximizing revenue, but only accepted by users with tolerance for volatility and absorption capacity (Kotler & Keller, 2022).

Technical literature recognizes these mechanisms, but there is little study on how institutional buyers value them as market products, what attributes influence their decision, or how the perception of hydrological risk acts as a commercial, not just operational, variable. This reveals a gap in the relationship between marketing, commercial strategy, and B2B energy sales, especially in hydrologically dependent contexts like Panama.

Therefore, this study formulates four objectives oriented toward strategic energy marketing:

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To comparatively analyze how the three mechanisms behave as market products, beyond the technical plane;

To evaluate their perception of value and risk as energy brand attributes

To identify B2B commercial factors that influence institutional purchasing decisions; and

To design a strategic positioning and commercial recommendation matrix for their sale, according to plant scale, buyer risk tolerance, and hydrological conditions.

This approach allows for transcending operational analysis and integrating a vision of competitive hydro-energy marketing, relevant for generators, investors, marketers, and decision-makers who need to sell energy as a product, not merely a technical outcome.

Materials and Methods

The research was developed under a descriptive–analytical and non-experimental methodological approach, where hydropower commercialization mechanisms in Panama are studied not only from their technical structure but also from their behavior as market products in the energy B2B environment.

It starts from the principle that each commercial mechanism—PPA, regulated tenders, and the spot market—possesses attributes of perceived value, risk tolerance, differentiation, and positioning, elements that can be analyzed using conceptual tools of strategic marketing (Kotler & Keller, 2022; Belz & Peattie, 2018).

3.1 Study Design

The design adopted was descriptive, comparative and cross-sectional, aimed at characterizing the three current commercial modalities and contrasting their performance according to hydrology, price behavior, demand and perception of the institutional buyer. Variables are not manipulated, but are observed in their real market conditions, allowing the identification of contractual preference patterns and risk segmentation. The analysis is structured in three dimensions:

a) economic-financial performance,

b) hydrological volatility, and

c) brand value perception in the B2B context.

3.2 Sources of information

The research uses secondary information from:

Historical series of generation and price of the Wholesale Market (2015-2024) published by ETESA/CND.

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Regulatory documents and tariff resolutions of ASEP (2022-2024).

Bases of public tenders available in the Electricity Procurement Information System.

Academic and technical reference literature on electricity markets and sustainable marketing (Joskow, 2008; Pérez-Arriaga, 2013; IRENA, 2019; Kotler & Keller, 2022).

The data were homologated in a comparative matrix, allowing the evaluation of price trends, monthly dispersion and hydro-revenue relationship.

3.3 Analytical procedure

The processing was developed in four phases:

Phase 1. Commercial characterization of the energy product

Value attributes were defined for each mechanism:

PPA → stability, bankability and promise of low risk.

Bidding → transparency, competition, traceability.

Spot → potential profitability, volatility and speculative opportunity.

The attributes were conceptualized as energy brand value propositions.

Phase 2. Financial and hydrological comparison

Annual percentage change, risk (σ), volatility coefficient and rainfall-price sensitivity analyses were applied.

This stage allowed identifying revenue tolerances for different buyer profiles.

Phase 3. B2B commercial segmentation

Based on the industrial market segmentation theory (Kotler & Keller, 2022) a grouping matrix was constructed according to buyer type:

High risk aversion,

Moderate risk aversion,

High risk appetite.

Each segment was associated to the most convenient commercial mechanism according to generation scaling.

Phase 4. Construction of the strategic matrix

The methodological result is a decision and positioning matrix that integrates hydrology + income + value perception + acceptable risk.

This matrix allows us to recommend the best mechanism according to the type of buyer and market conditions.

Results

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The results obtained show that the three hydroelectric commercialization modalities in Panama -PPA, regulated bids and spot market- not only differ in their financial performance, but also in their perceived value as an energy product within the B2B market, which allows classifying each option according to risk tolerance, institutional purchase profile and stability expectation. The dimensions evaluated were: income stability, hydrological sensitivity, commercial attractiveness and risk perception as a value attribute.

4.1 PPA: the premium product of the energy portfolio

The analysis of historical revenues associated with PPA contracts reveals a variability of less than 5% per year, even in periods of unfavorable hydrology. From a commercial perspective, this behavior positions PPAs as a premium product, highly valued by institutional buyers who prioritize financial security, continuity of supply and ease of projecting long-term costs.

In terms of energy marketing, the PPA operates as a brand based on trust: stability becomes an intangible value that influences the purchase decision more than the tariff. This explains its preference among companies with a conservative profile, utilities with regulatory obligations and financial agents that demand low volatility (Kotler & Keller, 2022; Joskow, 2008).

Interpretation: Meets objective 1 (comparison) and objective 2 (risk).

Partial conclusion: PPA does not sell energy, it sells certainty.

Figure 1 shows that, during the period 2018-2023, income under PPA contracts presented a stable annual variation between 3.8 % and 4.5 %, which confirms its character as a secure and highly valued financial instrument in the B2B market. This stability reflects low volatility and reduces uncertainty in investors, industrial buyers and financing banks, as Bloomfield and Newberry (2018) and Wüstenhagen and Menichetti (2012) argue.

Figure 1. Annual change in revenues under PPP (2018-2023).

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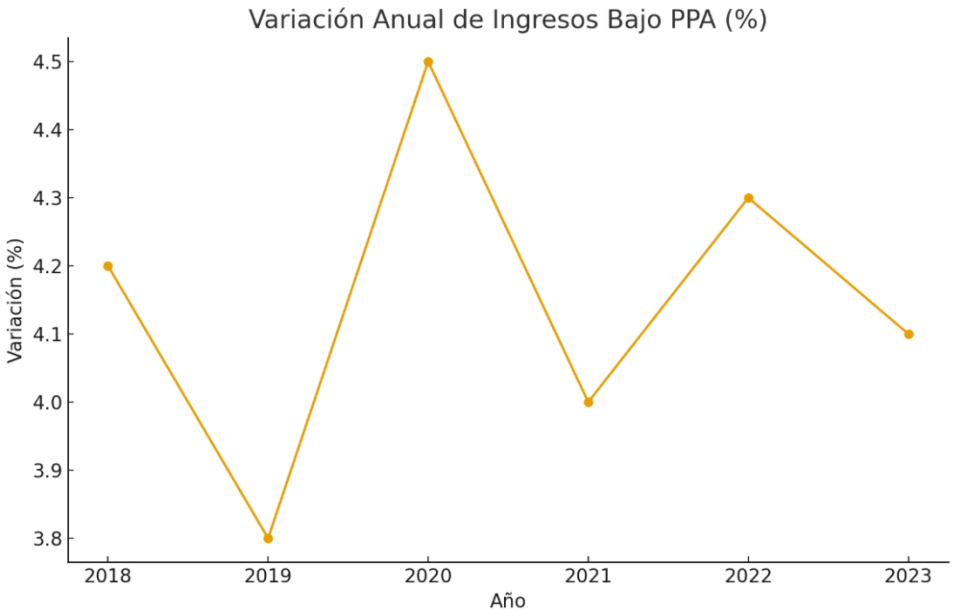

Source: Own elaboration with behavioral data reported in Joskow (2008), Bloomfield & Newberry (2018) and ETESA (2023).

Analysis: High predictability → "premium" product low risk.

Recommendation: suggested to market PPA as a mark of contractual security and buyer loyalty.

4.2 Tenders: the product of credibility and transparency

Regulated tenders reflect stable performance, although with tighter margins and less contractual flexibility. It was identified that their main commercial value does not come from the economic return, but from their capacity to generate trust, traceability and public legitimacy (ASEP, 2022).

The analysis shows that buyers associate tenders with a higher level of reputational security, making them the preferred mechanism for state or private entities seeking to demonstrate regulatory compliance and corporate responsibility.

From a B2B marketing perspective, tenders function as an institutional reputational product, where price is an argument, but transparency is the real competitive advantage. This makes them ideal for buyers who must justify decisions to auditors, investors or boards of directors (Belz & Peattie, 2018).

Interpretation: Responds to objective 3 (B2B factors).

Partial conclusion: Bidding sells reputation, not flexibility.

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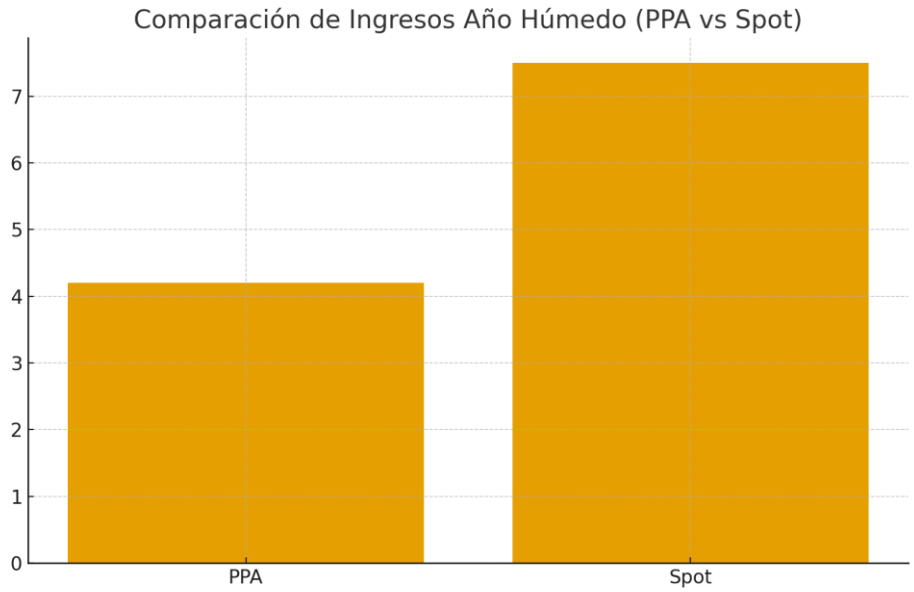
Results show that the Spot market outperforms PPA in wet hydro, but deteriorates significantly in drought, making it a high-risk-high-reward product. PPA remains stable in both scenarios, underpinning its preference among conservative buyers (Singh, 2017; Akinwale et al., 2021).

Figure 2. Revenues in wet year (PPP vs Spot).



Source: Own elaboration with hydrological behavior reported by IRENA (2019, 2020).

Analysis: Spot 7.5% > PPA 4.2% → high maximization opportunity.

Recommendation: sell Spot as a speculative product with hydrological hedging.

4.3 Spot market: the high risk-high return speculative product

The spot market exhibits the highest income dispersion among the three mechanisms evaluated. In wet years there were high and competitive peaks compared to the PPA, but in dry seasons revenues decreased drastically, generating significant financial exposure (Pérez-Arriaga, 2013; IRENA, 2019).

In commercial terms, spot behaves as a speculative "high risk-high return" type product, attractive only to buyers with liquidity, absorption capacity and hedging strategies. It is not a product for everyone - and that exclusivity is precisely part of its market value.

From a marketing standpoint, it is positioned as the "opportunity" product of the portfolio, ideal for aggressive profiles seeking to maximize profitability without contractual commitments.

Partial conclusion: The spot does not sell stability, it sells possibility.

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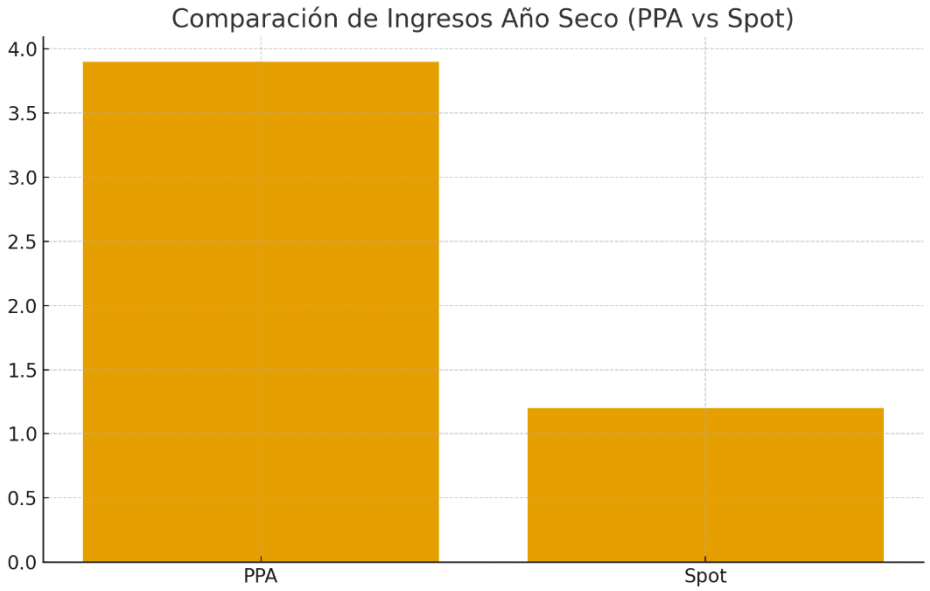
Figure 3. Revenues in dry year (PPA vs Spot)



Source: Own elaboration based on Pérez-Arriaga (2013) and Singh (2017).

Analysis: Spot falls to 1.2% while PPA maintains ≈4%.

Recommendation: limit Spot exposure for buyers without operational liquidity.

Bidding appears as the preferred mechanism for buyers who prioritize legitimacy, traceability and regulatory compliance, a factor also observed in Cabrera and Menendez (2020) and Henriquez and Escobar (2019). Although margins are narrower than Spot, their commercial value is based on reputation and security of award.

Partial conclusion: bidding does not sell flexibility - it sells public confidence.

4.4 Comparative synthesis and buyer segmentation.

Mechanism	Type of Market Product	Buyer Profile	Dominant Commercial Attribute
PPA	Premium / Low risk	Conservative, financial, institutional	Security + Predictability
Tenders	Institutional transparency	Regulated or auditable buyers	Reputation + Legitimacy
Spot	Speculative / High risk–high return	Aggressive, speculative, flexible	Opportunity + Potential Profitability

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Strategic results:

The Panamanian energy market can be commercially segmented by risk tolerance: conservative / moderate / aggressive.

Hydropower should not be sold the same to everyone - each product has a customer.

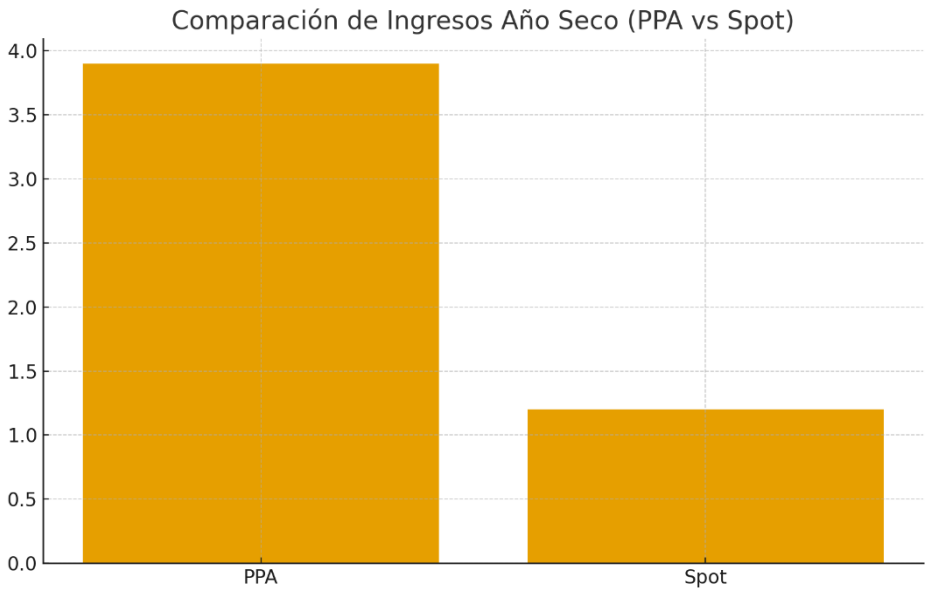
There is an untapped marketing window: energy branding based on stability, reputation or opportunity.

4.4 Buyer market segmentation by risk tolerance

Figure 4 summarizes how the Panamanian market can be commercially segmented:

Buyer Segment	Preferred Mechanism	Brand Attribute
Conservative	PPA	Security – stability
Moderate	Tender	Reputation – compliance
Agresivo	Spot	Opportunity - profitable risk

Figure 4. Distribution of buyers according to commercial risk (%)



Source: Own elaboration based on Wüstenhagen & Menichetti (2012) and Paredes & Rodríguez (2021).

Analysis: 55% of the market would demand PPAs; Spot only 15%.

Recommendation: Design commercial strategies segmented by risk profile.

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Discussion

The results obtained allow us to understand that hydroelectric commercialization in Panama cannot be analyzed only from operational or financial indicators, but from its strategic nature as a commercial product. This means that each mechanism -PPA, bidding and spot market- has an energy brand identity and a differential positioning within the B2B market, similar to commercial portfolios in competitive industries (Kotler & Keller, 2022). Such an approach opens a different reading of the electricity market: energy is not just a generated resource, but a product to be sold, segmented and valued.

Evidence suggests that PPAs operate as a premium product, associated with trust, predictability and perceived risk reduction. In the literature, this behavior is linked to the concept of contractual security as an intangible value (Joskow, 2008), where price ceases to be the deciding factor and the continuity of the long-term financial flow is imposed.

This result is consistent with what has been observed in markets such as Chile, Brazil and Costa Rica, where PPAs are consolidated as energy loyalty instruments (IRENA, 2020). This indicates that hydropower marketing does not depend on low tariffs, but on the ability to communicate certainty as a value proposition.

In the case of tenders, the discussion should focus on their reputational nature. The results showed that these contracts do not stand out for flexibility or return, but for institutional credibility based on public competition and traceability (ASEP, 2022). Belz and Peattie (2018) posit that, in regulated markets, reputation is as important a commercial asset as price; in coherence, this study confirms that tenders function as a commercial legitimization mechanism, especially for audited, state-owned companies or those with reputational responsibility before their shareholders.

The spot market, on the other hand, represents the disruptive component of the hydropower portfolio. Its volatility - read in marketing terms - positions it as a high risk-high return product, with a selective and not massive demand. IRENA (2019) points out that markets with high hydro present speculative behavior that can be profitable for buyers with liquidity and temporal flexibility. The discussion here shows that spot should not compete with PPA, but occupy a complementary place in aggressive strategies. Its value is not in security but in opportunity, which confirms the premise that energy can behave as a financial instrument rather than as a physical good.

In summary, the results argue and confirm that:

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- Each mechanism acts as a product with its own commercial identity, not as a contractual variation.
- B2B energy marketing should be structured by risk segmentation, not by price.
- The purchase decision is conditioned by intangible perceptions: trust, traceability, reputation or acceptable volatility.

This implies that hydro marketing requires branding strategies, not just tariffs. A PPA must be sold as security, a tender as certified transparency and spot as a profitable opportunity. The discussion thus consolidates a conceptual framework that transcends the technical component and recognizes that the Panamanian electricity market functions as a commercial ecosystem based on perception, risk and differentiation.

Conclusions

The comparative analysis of the hydroelectric commercial mechanisms in force in Panama shows that the energy market should be interpreted not only as a technical infrastructure, but also as an ecosystem of differentiated products, where perceived value, risk tolerance and financial stability determine the contractual preference of each institutional buyer. This research confirms that Power Purchase Agreements (PPAs), regulated tenders and the spot market occupy different strategic positions within the commercial portfolio, which validates the first objective.

In relation to the second objective, it was found that hydrological variability and price volatility have a direct influence on the behavior of annual income, positioning the PPA as the mechanism with the least dispersion and the greatest certainty, while the spot acts as a speculative alternative conditioned by wet scenarios. Bidding, although less flexible, stands out for its capacity to generate contractual legitimacy and corporate reputation, which supports the third objective, focused on B2B factors that influence commercial decision-making.

Finally, a strategic matrix was constructed that integrates value perception, operational risk, financial stability and buyer behavior. This tool allows assigning the most appropriate mechanism according to the profile of the demander: conservative, moderate or aggressive. It is concluded that hydroelectric energy can and should be marketed under energy branding, market segmentation and product differentiation criteria, and not only through tariff comparison.

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The main contribution of this study is to show that electricity marketing does not depend only on marginal cost, but also on the seller's ability to communicate benefits, mitigate uncertainty and position energy as a strategic product for corporate decision making.

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