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Green Electricity Decisions of Manufacturing SMEs in Southern Vietnam under Peak-Hour Tariff Reform

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Abstract: *Vietnam's 2025 restructuring of peak-hour electricity tariffs—shifting from a split daytime–evening window to an evening-only block (17:30–22:30)—may have altered the economics of rooftop solar, the main green electricity option for manufacturing SMEs. This conceptual paper develops testable propositions; quantitative scenarios serve only as illustrative anchors under stated assumptions, not econometric findings. It is, to our knowledge, the first to examine concurrent intermediary–policy disruption in a rooftop solar market, where third-party developers who mediate adoption through PPA contracts are themselves destabilized by the policy change they transmit. Drawing on secondary policy data, industry reports, and an integrated Prospect Theory–Institutional Theory lens, the paper advances six propositions: five behavioral propositions across four SME segments (contract-locked, self-invested, prospective adopters, and operationally differentiated factories), plus an institutional proposition contrasting export-oriented (CBAM-pressured) and domestically focused SMEs. The analysis highlights a possible policy tension between the systemic rationale for tariff reform and its potential to weaken the rooftop-solar business case and focuses on southern Vietnam, where industrial-park density and solar irradiance are highest.*

Keywords: *Green Electricity, Rooftop Solar, SME, Peak-Hour Tariff, Prospect Theory, Institutional Theory, PPA, BESS, Intermediary, Vietnam*

1. Introduction

Rooftop solar has become a central green electricity option for manufacturing SMEs in Vietnam. By 2025, the national grid included over 105,000 rooftop systems with a combined capacity of roughly 10,220 MWp, and manufacturing SMEs—more than 97% of enterprises and around 40% of GDP—constituted the largest addressable market for distributed solar. For several years, the value proposition was straightforward: install panels, consume electricity on site, and recover capital costs in less than three years, a process often facilitated by third-party developers via long-term power purchase agreements (PPAs).

In 2025, Decision 963/QD-BCT restructured peak-hour tariffs for the first time since 2014. The previous schedule, with morning (09:30–11:30) and evening (17:00–20:00) peaks, was replaced by a single evening peak from 17:30 to 22:30. Because morning peak hours previously aligned with rooftop solar output, this reform may have altered the economics of both self-invested solar systems and developer-operated PPAs.

This paper asks how the tariff reform may influence green electricity decisions among manufacturing SMEs in southern Vietnam. Three questions guide the analysis:

(i) How might SMEs with existing rooftop solar respond?
(ii) How could the reform affect prospective adopters?
(iii) What role might developers play as intermediaries transmitting policy changes into SME decision making?

The contribution is conceptual. The paper develops propositions grounded in secondary evidence and theory, rather than reporting empirical results. The most distinctive element is the theorization of concurrent intermediary–policy disruption in a rooftop solar market dominated by PPAs. The analysis also introduces an institutional differentiation between export-oriented SMEs facing CBAM/ESG pressures and domestically focused firms.

The remainder of the paper is organized as follows. Section 2 reviews the literature on SME solar adoption, tariff structures, and intermediaries in energy transitions. Section 3 outlines the analytical approach and scope. Section 4 presents the policy context and develops behavioral and institutional propositions. Section 5 discusses policy and theoretical implications, confounding factors, and directions for empirical research. Section 6 concludes.

2. Literature review

2.1. SME solar adoption

Most research on distributed solar adoption focuses on households or large commercial users. Studies on SMEs remain comparatively scarce. Schwartz and Batabyal (2024) offer a rare SME case study, highlighting shorter planning horizons and strong reliance on external advisors in rooftop PV decisions. In the Vietnamese context, Moon et al. (2024) prioritize financing mechanisms for the national solar market without disaggregating by enterprise size, while Nguyen et al. (2023) evaluate rooftop solar policy feasibility at a macro level.

Outside Vietnam, empirical work on green electricity adoption by German SMEs (Rahbauer et al., 2018) and solar panel adoption among Mexican SMEs (Hancevic & Sandoval, 2023) identifies financial constraints, information gaps, and environmental responsibility as key determinants. However, these settings lack the PPA-dominated developer structure present in Vietnam. Within ASEAN, studies from Indonesia and Thailand describe emerging rooftop-solar markets and business models but do not consider SME responses to peak-tariff restructuring.

2.2. Tariff structure and solar economics

Interactions between time-of-use tariffs and rooftop solar value have been studied primarily in developed markets, often emphasizing residential customers. Evidence shows that tariff design can significantly influence payback periods and load-shifting incentives. In emerging markets, fewer studies examine how peak-hour restructuring affects developer-based PPA models, particularly when developers bear tariff risk. In Vietnam, Do et al. (2024) discuss investment barriers for solar and wind but do not address the post-2025 tariff reform.

2.3. Intermediaries in energy transitions

Transition intermediaries have been conceptualized as actors that facilitate learning, coordination, and scaling in sustainability transitions. Kivimaa et al. (2019) propose a typology of systemic and niche intermediaries, while Scharnigg and Sareen (2023) examine how intermediaries shape solar energy communities in Portugal. Bollinger and Gillingham (2012) highlight peer effects as a related social mechanism. Yet existing work generally assumes that intermediaries operate under relatively stable policy regimes. How they behave when their own financial models are simultaneously disrupted by policy change remains under-explored. This gap motivates the focus on developer-mediated rooftop solar PPAs in Vietnam.

3. Methodology

This paper is a conceptual policy analysis that develops testable propositions rather than reporting confirmed findings. Quantitative scenarios presented in Section 4.2 are explicitly illustrative: they anchor the propositions with plausible magnitudes under stated assumptions but are not econometric results. Estimation of effect sizes is deferred to subsequent empirical studies.

The evidence base combines four sources: (i) regulatory texts from the Government Gazette; (ii) official EVN and Ministry of Industry and Trade (MOIT) statistics; (iii) reports from research institutions and industry media; and (iv) the authors' professional experience in Vietnam's renewable energy sector. When primary government data were unavailable, journalistic sources were used and clearly flagged.

Academic literature was identified through Scopus and Google Scholar searches using keywords such as "rooftop solar", "SME", "Vietnam", "peak tariff", and "intermediary" for the period 2018–2026, supplemented by backward citation tracking. Market data were cross-checked across at least two independent sources where possible. The selection strategy is purposive and consistent with the aim of conceptual, rather than systematic, review.

The analytical framework blends Prospect Theory at the micro level (loss aversion, reference dependence, and framing in SME decision making) with Institutional Theory at the macro level (coercive and mimetic isomorphism shaping organizational responses). The regional focus is southern Vietnam, chosen because it has (i) the highest density of industrial parks and manufacturing SMEs; (ii) high solar irradiance (4.5–5.5 kWh/m²/day); and (iii) the only available sub-national data on industrial load-shifting commitments from EVN's Southern Power Corporation. Propositions may apply elsewhere in Vietnam but generalizability to other regions and countries requires empirical verification.

The authors' involvement in the sector provides contextual insight but also a potential source of interpretive bias. To mitigate this risk, the analysis labels all propositions as hypotheses, sources quantitative claims, and explicitly invites empirical testing rather than asserting conclusions.

4. Policy analysis and propositions

4.1. Tariff reform context

Decision 963/QD-BCT consolidated industrial peak pricing into an evening block from 17:30 to 22:30, eliminating the earlier morning peak from 09:30 to 11:30. Table 1 summarizes the shift relative to the previous schedule in Circular 16/2014.

Table 1. Peak-hour framework before and after Decision 963/QD-BCT

Time Block	Old (Circular 16/2014)	New (Decision 963/QD-BCT)
Peak	9:30–11:30 & 17:00–20:00 (5h, 2 blocks)	17:30–22:30 (5h, 1 block, Mon–Sat; none Sun)
Standard	Remaining hours excl. off-peak	6:00–17:30 & 22:30–00:00
Off-Peak	22:00–04:00 (6h)	0:00–6:00 (6h, all days)
Peak rate (mfg, <6kV)	VND 5,025–5,422/kWh	Same rate—shifted to evening only

The reform responds to a pronounced "duck curve": the industrial share of demand rose from roughly 30% to over 50% after 2019, while daytime solar generation increased, making the old tariff structure misaligned with system conditions.

4.2. Illustrative avoided-cost scenarios

To illustrate how the reform could affect rooftop solar economics, the paper models two stylized factory load profiles. Assumptions include a solar generation peak between 10:00 and 14:00, standard daytime operations from Monday to Saturday, south-facing panels without major shading, and system sizes between 30 and 110 kWp, typical for manufacturing SMEs. Scenario A assumes evenly distributed daytime usage; Scenario B assumes 40% of consumption concentrated in the former morning peak to represent factories that aligned high-load processes with solar output under the old tariffs.

Table 2. Illustrative avoided-cost scenarios under old vs. new tariffs (manufacturing, <6 kV

Parameter	Old Framework	New Framework	Scenario A (even load)	Scenario B (peak-heavy)
Morning (9:30–11:30)	Peak: 5,422	Std: 3,152	−42%/kWh	−42%/kWh
Midday (11:30–17:00)	Std: 3,152	Std: 3,152	No change	No change
Est. blended avoided cost	~3,500–3,800	~2,900–3,150	~−12–15%	~−30–38%
Est. payback (30–110 kWp)	2.5–2.9 yrs	Depends on profile	~3.0–3.4 yrs	~3.5–4.2 yrs

Under these assumptions, factories in Scenario B face avoided-cost reductions of approximately 30–38%, while Scenario A factories face reductions of about 12–15%. These ranges are meant to bracket plausible outcomes, not to estimate population averages. The heterogeneity in impacts is central to the behavioral segmentation developed below.

4.3. Green electricity options post-reform

Manufacturing SMEs can access several green electricity options, including self-invested rooftop solar, PPAs, direct power purchase agreements (DPPAs), renewable energy certificates (RECs), and solar-plus-battery energy storage systems (BESS). Table 3 summarizes indicative capital requirements, regulatory complexity, SME fit, and potential post-reform status for each option.

Table 3. Green electricity options for manufacturing SMEs after the tariff reform

Method	Capital	Regulatory	SME Fit	Potential Status	Possible Dynamic
Rooftop Solar	High	Low (Decree 58)	Med–High	Could weaken	Peak premium lost
PPA Model	Zero	Low	High	May be stressed	Margin pressure on old PPAs
DPPA	Negotiated	High	Low (exc. IPs)	Unchanged	Access expanding via Res. 253
RECs	Low	Medium	High (export)	Unaffected	Could gain relative appeal
Solar-plus-BESS	Very High	Medium	Low (cost)	Could strengthen	May capture evening peak

BESS may become more important in capturing evening peak value but remains capital-intensive, potentially widening the gap between SMEs that can and cannot invest in storage. RECs, by contrast, are unaffected by tariff structures and may become increasingly attractive to export-oriented SMEs facing CBAM and ESG requirements.

4.4. Developer vulnerability

Third-party developers are particularly exposed to the reform. Many PPA financial models implicitly relied on a morning peak premium that is no longer available. In practice, developers may respond by seeking to reprice PPAs, accepting margin compression, or retrofitting BESS into existing systems. Each pathway carries distinct risks for both developers and SMEs, and changes in the way developers frame the economics of rooftop solar may transmit policy shocks to SME decision makers.

4.5. Behavioral and institutional propositions

The analysis yields six propositions grounded in Prospect Theory, Institutional Theory, and the policy context.

- **P1 (Contract-locked SMEs).** SMEs bound by existing PPAs may experience "constrained coping": dissatisfaction anchored to previous savings levels, limited renegotiation leverage, and a tendency to wait passively for contract expiry. Although they may remain financially better off than without solar, loss framing relative to the prior baseline may dominate perceptions.
- **P2 (Self-invested SMEs).** Among self-invested adopters, responses may bifurcate by financial capacity. Firms with headroom may invest in BESS or complementary measures; more constrained firms may default to inertia or operational adjustments (e.g., rescheduling loads). The moderating "pain threshold" likely differs by load profile, with Scenario B firms more likely to cross it than Scenario A firms.

- **P3a (Delay tendency).** Some prospective adopters may delay rooftop solar investment due to weaker ROI projections under the new tariffs, reinforced by negative comparisons with pre-reform peer testimonials.
- **P3b (Acceleration tendency).** Other SMEs, especially those facing steep evening cost increases, may accelerate adoption of solar-plus-BESS, driven by loss aversion rather than pure payback calculations. Export-oriented SMEs under CBAM/ESG pressure may be less sensitive to short-term ROI changes if market access becomes the primary reference point.
- **P4a (24/7 factories).** SMEs with continuous operations may make faster BESS decisions because peak-tariff losses are frequent and unavoidable, increasing the salience of mitigating action.
- **P4b (Flexible-shift factories).** SMEs with flexible production schedules may reduce or reschedule evening operations as a controllable loss to avoid externally imposed cost increases. Media reports that over 5,200 industrial customers in the Southern Region pledged load adjustments are directionally consistent with this proposition but do not constitute verified behavioral outcomes.
- **P5 (Developer-mediated transmission).** Developer behavior may function as an intermediary mechanism that transmits policy effects into SME decisions. If developers shift from gain-oriented to loss-oriented or cautious framing, adoption patterns may change accordingly. This extends existing intermediary theory by identifying concurrent disruption of both the intermediary's financial model and the policy environment it mediates—a setting not considered in prior typologies.
- **P6 (Institutional pressure differentiation).** Export-oriented SMEs facing coercive pressure from CBAM and ESG reporting mandates may respond differently to tariff reform than domestically focused SMEs that respond primarily through mimetic isomorphism. For the former, market access requirements may sustain or accelerate green electricity adoption despite weaker marginal economics; for the latter, peer behavior and developer testimonials may play a larger role, making them more responsive to tariff-induced changes in ROI.

5. Discussion

5.1. A potential policy tension

If the propositions hold, the tariff reform may generate a policy tension. On one hand, consolidating peak pricing in the evening appears systemically necessary to address the duck curve. On the other hand, it may weaken the rooftop-solar business case for SMEs, particularly for profiles similar to Scenario B. The presence of a developer layer, whose financial distress could amplify SME-level uncertainty, differentiates Vietnam from contexts where adopters invest directly without intermediaries.

Potential policy responses could include targeted green credit for BESS, adjusted feed-in arrangements for evening exports, or complementary instruments aimed at preserving SME-level incentives while maintaining system-level efficiency. The appropriateness of such measures depends on empirical validation of the mechanisms proposed here.

5.2. Confounding factors

The tariff reform is only one of several forces shaping SME green electricity decisions. Other factors include CBAM and ESG mandates for export-oriented firms, declining global BESS costs, the fallout from Vietnam's feed-in-tariff controversy, and broader macroeconomic conditions such as interest rates and credit access. The conceptual framework advanced here should therefore be understood as specifying plausible mechanisms operating amidst multiple concurrent influences rather than isolating the reform's causal effect.

5.3. Theoretical implications

This paper offers a context-specific conceptual extension to existing theory rather than a new theoretical framework. Three contributions are emphasized. First, it identifies and theorizes concurrent intermediary–policy disruption in a rooftop solar PPA market (P5), a setting not examined in prior work on intermediaries in sustainability transitions. Second, it introduces an institutional differentiation proposition (P6) that predicts divergent responses to identical policy changes based on exposure to coercive (CBAM/ESG) versus mimetic (peer) pressures, a dimension largely absent from SME solar adoption studies in Germany and Mexico. Third, it links Prospect Theory constructs to a five-segment SME architecture defined by contract status and operational flexibility (P1–P4), reflecting Vietnam's PPA-dominated market structure.

These contributions remain provisional until tested empirically, but they highlight mechanisms that may be relevant in other emerging markets where developers mediate rooftop-solar adoption under evolving tariff regimes.

5.4. Practical implications

For developers, the propositions suggest that the traditional rooftop-solar PPA model may be at an inflection point, potentially necessitating shifts toward solar-plus-storage or portfolio products and more nuanced client segmentation. For SMEs, green electricity strategies may increasingly involve balancing rooftop solar, BESS, RECs, and participation in DPPAs, especially for export-oriented firms subject to stringent decarbonization demands.

5.5. Limitations and future research

The analysis is subject to several limitations. The evidence base is selective and largely secondary, raising the possibility of confirmation bias. Illustrative scenarios in Table 2 rely on assumptions about factory load profiles for which no representative data are available; the reported ranges are therefore plausible brackets, not central tendency estimates. The figure of 5,200 industrial customers pledging load adjustments derives from journalistic accounts of stated intentions rather than observed behavior.

Future research should test the propositions using empirical designs. A qualitative multiple case study of manufacturing SMEs in southern Vietnam, stratified by P1–P4 segments and export orientation, would provide a first step in probing P5 and P6. Subsequent quantitative work—such as surveys, billing-data analyses, or natural experiments linked to tariff changes—could estimate effect sizes and assess the relative weight of confounding factors.

6. Conclusion

Vietnam's peak-hour tariff reform may mark a significant juncture for rooftop solar and other green electricity options among manufacturing SMEs in southern Vietnam. The paper develops six propositions linking tariff restructuring to SME decisions across behavioral segments, intermediary dynamics, and institutional contexts. The most distinctive contribution is the identification of concurrent intermediary–policy disruption in a PPA-based rooftop solar market, an extension of intermediary theory beyond the stable-regime settings that dominate existing work. Whether the proposed mechanisms and segmentations hold empirically is a matter for the qualitative and quantitative studies outlined in the future research agenda.

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