REPORT

Clean Energy Business Model and Net-Zero Roadmap for Thang Long II Industrial Park

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Prepared by:

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Executive Summary

This initiative, ***Pilot Energy Investment and Planning for Industrial Parks and Economic Zones: Initial Study for Thang Long II Industrial Park***, is supported by the Southeast Asia Energy Transition Partnership (ETP) under UNOPS, in collaboration with Vietnam's Ministry of Finance (MoF). Its overarching goal is to advance sustainable energy practices in Vietnam's industrial parks through a pilot assessment of Thang Long II Industrial Park (TLIP II) in Hung Yen Province.

The report consolidates six months of analytical work combining policy research, technical assessment, and financial modelling. It presents a comprehensive analysis of the current power system, energy demand–supply patterns, and investment potential at TLIP II. Building on these findings, it proposes a clean energy business model and a roadmap for achieving Net Zero emissions by 2035, structured around technical feasibility, financial viability, and regulatory readiness.

The study applied both top-down and bottom-up approaches. At the macro level, it gathered data and policy insights from MoF, Hung Yen's Industrial Park Management Board, Hung Yen Power Company, and provincial departments. At the micro level, detailed surveys and energy audits were conducted across TLIP II's manufacturing tenants. A field survey in June 2025 verified on-site data and validated assumptions for energy consumption, load profiles, and rooftop solar potential. This multi-layered approach ensured analytical accuracy and relevance to real-world conditions.

The study highlights the need to shift from a conventional, one-way electricity supply model to a distributed energy ecosystem that can be coordinated and optimized in real time. Against the backdrop of growing pressure from markets, supply chains, and national policy frameworks to reduce emissions, the report argues that **industrial parks must no longer be viewed simply as energy consumers but as critical actors in Vietnam's energy transition strategy.**

Context and Potential of Thang Long II Industrial Park

Hung Yen Province has become a major industrial hub in northern Vietnam, hosting 17 industrial parks and 534 FDI projects with cumulative registered capital of USD 6.7 billion. Japan is the largest investor, accounting for 173 projects worth USD 4 billion. In 2024, the province achieved 7.7% GRDP growth, driven by an 11.07% increase in industrial output, and its 2021–2030 master plan envisions 30 industrial parks over 9,589 hectares, emphasizing green and sustainable infrastructure.

TLIP II, established in 2006 as a joint venture between Sumitomo Corporation and Licogi, is one of Vietnam's leading industrial parks. Spanning 527.5 hectares, it hosts 103 FDI projects valued at USD 2.9 billion, achieving 95.4% occupancy and employing around 25,000 workers. The park's infrastructure includes a 189 MVA 110 kV substation, a 24,000 m^3/day water plant, and a 15,000 m^3/day wastewater treatment system. Its ongoing expansion (Phases 3 and 4) will elevate TLIP II into an integrated industrial–urban complex, making it a prime candidate for piloting Vietnam's first Net-Zero Industrial Park model.

Power System Assessment

TLIP II's electricity load is stable and well-utilized, reflecting its concentration of automotive and electronics manufacturers. Load curves align closely with solar irradiance, offering strong potential for rooftop solar integration. Twenty-five rooftop solar projects currently provide 23.9 MWp, while the technical potential is estimated at 80–100 MWp, capable of meeting up to 70% of peak demand when combined with energy storage.

However, the grid infrastructure in Hung Yen Province is under strain. The 500 kV Pho Noi substation operates above design capacity, and several 220 kV substations are near overload. Provincial power-development plans (2021–2030) include upgrading Pho Noi to 1,800 MVA, building a new 500 kV Hung Yen substation, and adding 248 km of 110 kV transmission lines—investments critical to maintaining reliability.

Beyond grid capacity, TLIP II's current business model, based on EVN-supplied power and internal redistribution, ensures stability but limits renewable adoption and ESG traceability. Without advanced Energy Management Systems (EMS) or access to direct power-purchase agreements (DPPAs), both technical and financial bottlenecks emerge once renewable penetration exceeds 20–30%. Limited access to green finance further constrains SMEs. Overcoming these challenges requires a fundamental shift in both energy infrastructure and regulatory models.

Clean Energy Pathways and Hybrid Business Models

To unlock TLIP II's potential, the study recommends a **hybrid clean energy model** that layers short-term compliance tools with long-term energy autonomy. The model integrates:

- **External DPPAs**: Immediate, no-capex sourcing of renewable electricity from off-site generators, enabling 5–15% cost savings and rapid ESG compliance.
- **Internal DPPAs**: Mid-term mechanisms allowing rooftop and ground-mounted solar within the park to sell power directly to tenants, pending regulatory reform.
- **Smart EMS and BESS**: Centralized digital control and energy storage to reduce 2–5% technical losses (≈0.7 GWh/year), optimize dispatch, and improve resilience.
- **I-RECs**: Transitional certification mechanisms enabling up to 60% of tenants to demonstrate renewable sourcing until internal trading matures.
- **Regulatory Sandbox (2026–2028)**: A pilot enabling intra-park energy trading, shared infrastructure, and data-driven regulation of the new business model.

This integrated approach provides immediate ESG and financial benefits while laying the foundation for long-term energy independence and grid-friendly operations.

Investment Scenarios

These pathways translate into three investment scenarios, each with goals developed through stakeholder workshops (management, tenants, People's Committee of Hung Yen Province, MOF), baseline audits (load curves, renewable energy potential), and techno-economic modeling (LCOE/NPV/IRR, RE cost curves). The scenarios are:

1. **2030 Hybrid Scenario – 50–70% Renewable Energy**
   By 2030, TLIP II can reach 50–70% renewable penetration with USD 30–40 million in investments for 50 MWp rooftop solar, 20 MW/40 MWh BESS, and a park-wide EMS. This pathway delivers immediate ESG compliance, tangible cost savings (~USD 1.2–1.5M annually), and shortens rooftop solar payback from 5–7 years to 4–6 years when combined with I-RECs.
2. **Accelerated Scenario – Net Zero by 2035**
   With USD 80–100 million in investment, TLIP II can achieve 100% renewable supply by 2035. This requires 130 MWp of rooftop solar, 30 MW/60 MWh BESS, and full EMS-enabled intra-park trading. Returns are higher (12–16% ROI), with payback periods of 6–9 years, and annual savings of USD 5–7 million. This scenario positions TLIP II as Vietnam's pioneering Net Zero industrial park and a magnet for green FDI.
3. **Baseline Scenario – Net Zero by 2050**
   A gradual pathway requiring USD 50–70 million, reaching Net Zero by 2050. It emphasizes incremental rooftop solar, phased EMS deployment, and reliance on evolving regulations.

Returns are modest (10–12% ROI) with longer payback (8–12 years), but the risk profile is lower and more inclusive for SMEs.

FINANCING STRATEGIES

The framework strategically combines traditional and innovative green finance instruments to unlock capital at scale, de-risk investments, and ensure SME inclusion. Each instrument is selected for its specific role, including compliance, cost reduction, revenue generation, or accessibility, and deployed in synergy across scenarios. Utilization prioritizes layering (e.g., guarantees and bonds), sequencing (e.g., short-term I-RECs to long-term internal DPPAs), and tenant-centric design (e.g., leasing for SMEs).

Table ES-1: Key Financing Instruments and Targeted Use for Thang Long II Industrial Park

Instrument	Purpose & Role	Target Use & Scale	Synergies
Green Bonds (ASEAN-aligned)	Fund large infrastructure (solar, BESS) with credible ESG labeling	USD 30–50M across scenarios	Paired with MDB guarantees to lower yields by 50–100 basis points (bps)
Sustainability-Linked Loans	Incentivize performance (RE% targets) via margin reductions	USD 20–25M (Hybrid/Accelerated)	KPIs tied to EMS deployment and I-REC issuance
PE/VC Funds	High-risk, high-return tech (EMS, BESS, smart metering)	USD 10–15M (Accelerated)	Co-invests with ECAs for tech imports
ECA Financing (Japan, Korea)	Low-cost, long-tenor loans for equipment imports	USD 10–12M	Bundled with local currency hedging to protect SMEs
I-RECs + Carbon Finance	Generate recurring revenue; bridge to full internal trading	USD 0.7–1.6M/yr	Funds O&M and accelerates payback (e.g., Hybrid: 4→6 years)
MDB/IFC Guarantees	De-risk private capital; reduce borrowing costs	Covers 20–30% of senior debt	Unlocks institutional investors; enables bond issuance
Leasing & Crowdfunding	Zero-upfront models for SMEs; democratize access	USD 5–10M (all scenarios)	Aggregated via park SPV; backed by I-REC revenue

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RISK ASSESSMENT AND MANAGEMENT

The report categorizes risks into **financial**, **legal and institutional**, and **market** risks. Key vulnerabilities include high upfront capital costs, unclear legal frameworks for intra-park energy trading, grid congestion, and market price volatility (for electricity and RECs).

The proposed mitigation framework centers on:

- **Diversified financing and risk sharing** through joint ventures and blended instruments;
- **Legal sandboxes** to pilot internal power trading;

- **Technical safeguards** via EMS-based grid codes; and
- **Phased deployment** to allow adaptive learning and capacity building.

POLICY ENABLERS

To realize the accelerated 2035 Net Zero roadmap, the report recommends eight breakthrough policy reforms, with a focus on deepening industrial-park governance, green finance mobilization, and grid integration. These support Vietnam's evolving regulatory landscape, unlock blended capital, and position TLIP II as a national prototype. MOF plays a key role in industrial-park licensing, master planning, and green finance architecture; MOIT handles energy mechanics; EVN oversees grid rules. The Hung Yen PPC acts as the local accelerator, including piloting reforms, issuing provincial green bonds, bundling with MOF guarantees, and offering fast-track licensing. Notably, the June 2025 merger of Hung Yen and Thai Binh into a unified Hung Yen Province requires an immediate priority action: revise the provincial master plan by Q1 2026. Led by the PPC with MOF, the update must embed renewable mandates, low-carbon zoning, and grid-support provisions to enable TLIP II's Net Zero roadmap. :

Table ES-2: Breakthrough Policy Reforms and Respective Roles of Stakeholders

Reform	Description/ Explanation	Importance	Lead Governmental Entity	Execution Role
Establish an Industrial Energy Transition Fund and credit guarantees	**MOF-seeded fund** offering partial credit guarantees, concessional loans below market, and viability gap grants.	De-risks debt , mobilizes private capital, closes SME equity gap.	**Ministry of Finance (MOF),** State Bank of Vietnam (SBV), PPC (People's Provincial Committee) for local implementation	Board: apply for funding; Tenants: access leasing; PPC: co-finance local share.
Launch Provincial Green Bonds with national backstop	Authorize PPCs to issue **municipal green bonds** for RE infrastructure, backed by MOF partial guarantee and project pipeline.	Crowds in institutional investors, reduces yields, funds 30–50% of Hybrid/Accelerated scenarios.	**MOF, PPC for issuance**	PPC: issue bonds; Board: submit bankable projects; MOF: guarantee facility.
Integrate clean-energy criteria into industrial-park licensing and planning	**Mandate RE + ESG audits in MOF master plans and licensing regulations**; prioritize low-carbon zoning in new/expanded parks.	Attracts rental premiums, prevents lock-in, aligns with national eco-industrial park strategy.	**MOF, PPC for provincial plans**	Board: prepare RE-compliant master plan; Tenants: meet ESG criteria; PPC: enforce zoning.
Enable shared infrastructure ownership and operation	**Revise regulations on industrial parks to allow multi-tenant SPVs owning**	Reduces SME capex, enables intra-park	**MOF, PPC for land allocation**	Board: form SPV; Tenants: co-own via leasing; SMEs:

	solar/BESS/EMS; permit revenue-sharing PPAs and leasing.	trading, scales shared RE.		zero-upfront access.
Develop a National Net-Zero Industrial Park Standard for certification and benchmarking	MOF tiered standard; links to **tax holidays, green bond eligibility, and carbon finance**.	Unlocks revenue, benchmarks vs. VSIP/Amata, signals ASEAN leadership.	**MOF; PPC for pilot certification**	Board: lead certification; Tenants: report data; PPC: offer local incentives.
Legalize internal DPPAs within industrial parks	Amend Electricity Law to permit direct tenant-generator contracts via private wires or virtual wheeling; allow park SPV as counterparty.	Enables tenant savings, scales RE.	**Ministry of Industry and Trade (MOIT), EVN for metering, PPC for local approval**	Board: sign DPPAs; Tenants: purchase direct; EVN: approve wheeling.
Recognize park operators as mini-grid managers	Grant licensed status for parks to operate internal grids, BESS dispatch, and EMS.	Cuts losses, ensures resilience, supports RE integration.	**MOIT, PPC for pilot licensing**	Board: operate mini-grid; Tenants: benefit from reliability.
Authorize grid-support services from industrial parks	Allow parks to provide **ancillary services** (frequency regulation, peak shaving) via BESS to EVN with clear remuneration	Provides clear revenue streams, reduces Hung Yen grid strain, accelerates payback.	**MOIT, EVN for dispatch integration; PPC for local pilots**	Board: dispatch BESS; EVN: integrate signals; Tenants: share revenues.

Implementation Roadmap and Next Steps

TLIP II is poised to redefine industrial parks from passive energy consumers to active renewable energy producers, including generating, storing, and trading clean power at scale. By 2030, the Hybrid Scenario transforms the park into a 70 MWp solar + 40 MWh storage microgrid, supplying 50–70% of its demand and exporting surplus via grid-support services. The Accelerated Scenario elevates TLIP II into a Net Zero energy-producing industrial park by 2035, with 130 MWp generation capacity exceeding internal load, enabling intra-park trading, ancillary services to EVN, and carbon-negative operations.

Table 0-1: Execution Plan for Thang Long II Industrial Park

Phase	TLIP II Key Actions	Owner	Indicative Timeline	Scenario
Phase 0: Pre-Launch	• Finalize **TLIP II RE Master Plan** (rooftop + EMS blueprint) • Secure **3+ anchor tenants** (RE100-committed FDI) • Form **TLIP II RECo SPV**	**TLIP II Management Board + PPC**	**Q4 2025**	All
	• Seed **Industrial Energy Transition Fund** (USD 50M, TLIP II as flagship)	**MOF**	**Q4 2025**	All
Phase 1: Pilot & Sandbox at TLIP II	• Launch **Sandbox** (internal DPPA + mini-grid pilot **exclusively at TLIP II**)	**PPC**	**Q1 2026**	All
	• Deploy **5–10 MW rooftop solar + 5 MW/10 MWh BESS** (Phase 3 roofs)	**TLIP II Board**	**Q3 2026**	Hybrid
	• Issue **Hung Yen's first provincial green bond (USD 15M) — 100% for TLIP II**	**PPC**	**Q3 2026**	Hybrid/Accelerated
	• Activate **TLIP II SME Green Leasing Facility (USD 5M)**	**PPC + TLIP II Board**	**Q4 2026**	Hybrid
Phase 2: Full Scale-Up at TLIP II	• Expand to **50 MWp solar + 20 MW/40 MWh BESS** (all phases + canopies)	**TLIP II SPV**	**Q2 2028**	Hybrid
	• Achieve **50–70% RE penetration** via **internal DPPAs + EMS dispatch**	**TLIP II Board**	**Q4 2030**	**Hybrid Complete**
Phase 3: Net Zero Certification at TLIP II	• Scale to **130 MWp + 30 MW/60 MWh BESS**	**TLIP II Board + PE/VC**	**Q3 2032**	Accelerated
	• Launch **ancillary services to EVN** from TLIP II BESS	**MOIT + EVN**	**Q1 2033**	Accelerated
	• Certify **TLIP II as Net Zero Industrial Park**	**MOF**	**Q4 2035**	**Accelerated Complete**
Phase 4: National	• Adapt **TLIP II model** to other **pilot parks**	**MOF + PPCs**	**2030–2032**	Baseline

Replication *(Triggered by TLIP II success)*	• Scale to **10+ parks** via **Net Zero Standard rollout**	**MOF**	**2033–2035**	Baseline

***Disclaimer**: All timelines are TLIP II-specific and assume Q1 2026 sandbox launch and post-merger master plan approval. Delays in regulatory reforms, funding, or EVN integration shift TLIP II milestones. Progress reviewed quarterly by TLIP II Board + PPC.*

As energy producers, industrial parks become critical nodes in Vietnam's power system: alleviating grid congestion, enhancing resilience, and accelerating PDP8/JETP goals. TLIP II's framework, blending policy reform, green finance, and digital infrastructure, offers a national blueprint and anchors Vietnam's Net Zero commitment.

ENERGY TRANSITION PARTNERSHIP

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This document is produced as part of the Southeast Asia Energy Transition Partnership's Pilot Energy Investment and Planning for Industrial Parks and Economic Zones: Initial Study for Thang Long II Industrial Park project