

SOLARIX WHITEPAPER v3.0

AI-Powered Investment Intelligence for Renewable Energy

Solarix Team -- March 2026

Table of Contents

1. [Executive Summary](#)
 2. [The Problem](#)
 3. [The Solarix Solution](#)
 4. [The Solarix Platform](#)
 5. [How It Works](#)
 6. [Market Opportunity](#)
 7. [Business Model](#)
 8. [Technology Architecture](#)
 9. [Regulatory Context](#)
 10. [Team and Partners](#)
 11. [Roadmap](#)
 12. [Appendix: Data Sources and References](#)
-

1. Executive Summary

The global energy transition requires \$4.5 trillion in annual investment through 2030. Today, the mechanisms for channeling capital into renewable energy projects remain fundamentally inadequate. Project finance is slow, exclusionary, and designed for institutional participants with million-dollar minimums. Carbon credit markets are fragmented across dozens of registries with inconsistent verification standards. Renewable energy certificates lack interoperability across borders. The result is a massive capital gap that slows the deployment of clean energy worldwide.

Solarix addresses this gap by providing the intelligence layer that makes renewable energy investable at scale. The Solarix platform combines AI-powered project evaluation, automated carbon and REC accounting, and standardized risk scoring to produce investor-grade assessments of renewable energy projects -- replacing months of manual due diligence with transparent, data-driven analysis delivered in hours.

Solarix is not a fund, an exchange, or a token issuer. It is the evaluation and analytics infrastructure that financial partners use to originate, assess, and monitor tokenized renewable energy investments. The platform produces an Solarix Score -- a standardized 0-100 rating across six dimensions of project quality -- along with carbon offset calculations, REC quantification, and ongoing performance monitoring. These outputs plug directly into the offering materials and investor dashboards of licensed financial platforms that handle the actual issuance, custody, and trading of security tokens.

This architecture is deliberate. By separating the intelligence layer from the financial infrastructure, Solarix can serve any licensed platform in any jurisdiction. The first deployment partners Solarix's AI evaluation with Univergy Solar K.K.'s portfolio of over 200 operational solar plants across Japan, with financial infrastructure provided by a licensed partner in Singapore. Subsequent markets include Korea, where landmark legislation passed in January 2026 creates a regulated framework for security token offerings effective January 2027.

The technology is built and maintained by MarinaChain Pte. Ltd., a Singapore-based climatetech company with backing from Korean government R&D programs. MarinaChain operates as a technology vendor to Solarix -- providing AI software, carbon accounting methodology, and data infrastructure on a SaaS basis. MarinaChain has no equity stake in the Solarix entity, no role in securities issuance, and no mention in offering documents. This separation ensures clean liability boundaries while giving Solarix access to world-class AI and climatetech engineering.

Solarix's core thesis is simple: the renewable energy sector does not lack viable projects or willing investors. It lacks the standardized, trustworthy evaluation infrastructure that connects the two. Solarix is that infrastructure.

2. The Problem

2.1 Project Finance Is Slow and Exclusionary

A typical utility-scale solar or wind project takes 12 to 24 months to reach financial close. The process involves layers of legal structuring, syndicated lending arrangements, and due diligence

workflows designed for institutional participants. Minimum investment thresholds routinely start at \$1 million or more. Retail investors, family offices, and smaller funds are effectively locked out of a \$500 billion annual market -- not because the risk-return profile is unattractive, but because the infrastructure to include them does not exist.

Once capital is deployed into a renewable energy project, it is typically locked for 10 to 25 years. Secondary markets for project finance positions are thin, bilateral, and opaque. An investor who needs to exit a position before project maturity faces steep discounts or no market at all. This illiquidity premium suppresses capital formation: many potential investors who would accept the underlying project risk refuse to accept the liquidity risk.

Security token offerings present a solution to both problems. By representing fractional ownership in project revenue streams as regulated digital securities, STOs lower minimum investment thresholds to accessible levels and enable secondary market trading on licensed platforms. The regulatory frameworks to support this are now in place across multiple jurisdictions. What is missing is a standardized, trustworthy mechanism for evaluating the projects themselves.

2.2 Carbon Credit Markets Are Fragmented and Opaque

The voluntary carbon market reached approximately \$2 billion in annual transaction value in 2024, a contraction from the 2022 peak driven by scrutiny over credit quality and verification integrity. However, this correction is widely regarded as a necessary maturation phase. Market projections from the Taskforce on Scaling Voluntary Carbon Markets, McKinsey, and BloombergNEF estimate the voluntary market reaching \$10 billion to \$25 billion by 2030, driven by tightening corporate net-zero commitments, improved verification standards including the Integrity Council for the Voluntary Carbon Market's Core Carbon Principles, and growing demand from hard-to-abate sectors.

The structural challenges are well documented: fragmented registries, inconsistent verification, opaque pricing, and double-counting risk. Credits trade across dozens of registries and brokers with no unified order book. Buyers cannot easily verify the provenance or retirement status of credits. Sellers face high intermediation costs. The result is a market that systematically underprices carbon reduction -- precisely the opposite of what climate policy demands.

Compliance markets are substantially larger. The European Union Emissions Trading System covers approximately 40% of EU greenhouse gas emissions and traded over EUR 750 billion in allowances in 2023. Carbon pricing mechanisms now cover roughly 25% of global greenhouse gas emissions across more than 70 jurisdictions, including the EU, United Kingdom, China, South Korea, and several Canadian provinces. The EU Carbon Border Adjustment Mechanism, which began its transitional phase in 2023 and moves to full implementation in 2026, extends carbon

pricing to imports of steel, cement, aluminum, fertilizers, electricity, and hydrogen -- signaling that carbon pricing coverage will expand further.

For renewable energy project investors, the ability to accurately quantify, track, and monetize the carbon offsets generated by their assets is a material component of total returns. Yet no standardized tool exists to automate this calculation at the project level, map it to the correct crediting methodology, and prepare registry-ready documentation. This work is done manually, inconsistently, and expensively.

2.3 Renewable Energy Certificates Lack Interoperability

Renewable energy certificates are the primary market-based instrument for tracking the environmental attributes of clean electricity generation. Each REC represents one megawatt-hour of electricity generated from a renewable source and can be sold separately from the underlying physical electricity. The global REC market has grown substantially, driven by corporate procurement commitments under frameworks such as RE100, the Science Based Targets initiative, and voluntary 24/7 carbon-free energy matching programs led by organizations including Google and Microsoft.

However, the REC market remains structurally fragmented. National and regional REC registries do not interoperate. Cross-border transactions require manual reconciliation between issuing and tracking registries. Provenance tracking is inconsistent -- buyers often cannot trace RECs back to the specific generating facility, vintage, or grid region. As corporations make increasingly granular clean energy procurement commitments, moving from annual matching to hourly matching, the existing REC infrastructure cannot keep pace.

2.4 The Green Bond Market

Green bonds -- fixed-income instruments whose proceeds are earmarked for climate and environmental projects -- represent the most mature segment of sustainable finance. Annual green bond issuance surpassed \$900 billion in 2024 and is on pace to exceed \$1 trillion, according to the Climate Bonds Initiative. Cumulative issuance since 2007 surpasses \$4 trillion.

The EU Green Bond Standard, finalized in 2023 and entering application in 2024, establishes a voluntary gold standard for green bond labeling, requiring alignment with the EU Taxonomy, detailed allocation reporting, and external review. In the United States, the Inflation Reduction Act has catalyzed record clean energy investment by providing long-term tax credit certainty.

Green bonds finance projects at the corporate or sovereign level. Tokenized energy asset securities can finance projects at the individual asset level with greater granularity and direct

revenue linkage. These instruments are complementary, not competitive. Solarix positions itself at the asset-level end of this spectrum, providing the evaluation intelligence that enables individual project investments.

2.5 The Market Gap

Each of the markets described above -- carbon credits, renewable energy investment, RWA tokenization, RECs, and green bonds -- is individually large and growing. Blockchain-based platforms have demonstrated viability in each domain independently. However, no existing platform addresses the critical bottleneck that spans all of them: **standardized, investor-grade project evaluation**.

Today, an investor considering a renewable energy project must independently assess:

- **Resource quality** -- Is the developer's yield study realistic relative to independent irradiance data?
- **Technical risk** -- Is the equipment Tier 1? What is the EPC contractor's track record?
- **Financial viability** -- Do the IRR assumptions survive stress testing against historical energy pricing?
- **Environmental impact** -- What is the actual carbon displacement, calculated against the local grid emission factor?
- **Regulatory compliance** -- Are the permits complete? Does the offering structure comply with applicable securities law?
- **Team credibility** -- Has the developer completed projects of similar scale on time and on budget?

This evaluation currently costs \$100,000 or more per project through consulting firms like DNV and takes six to eight weeks. It produces a bespoke report that is not comparable across projects, not machine-readable, and not accessible to smaller investors.

Solarix replaces this process with a standardized, transparent, AI-driven evaluation that produces comparable scores across projects, geographies, and energy types -- at a fraction of the cost and time.

3. The Solarix Solution

Solarix provides three integrated capabilities that together close the evaluation gap in renewable energy investment.

3.1 Standardized Project Evaluation

The Solarix Score is a composite 0-100 rating that assesses renewable energy projects across six weighted dimensions: resource quality, technical risk, financial viability, environmental impact, regulatory compliance, and team credibility. Each dimension draws on a combination of external data sources (satellite irradiance data, grid emission factors, equipment databases), AI-powered document extraction (PPAs, permits, financial models), and rules-based validation.

The score is accompanied by a detailed evaluation report -- typically 10 to 15 pages -- that explains the reasoning behind each dimension's rating, flags specific risks or data gaps, and provides actionable recommendations. The report is generated as both a PDF suitable for investor packages and structured JSON suitable for integration with financial platforms.

Every Solarix Score is reproducible. The same project documents and site coordinates will produce the same score, using the same data sources and scoring methodology. This reproducibility is what distinguishes Solarix from consulting-based due diligence, where results vary by analyst, firm, and engagement scope.

3.2 Automated Carbon and REC Accounting

Solarix's Carbon/REC Calculator takes solar plant operational data -- or estimated generation from capacity and location -- and produces carbon offset calculations mapped to the correct crediting methodology, along with REC counts and estimated market values.

The calculation engine looks up the appropriate grid emission factor for the project's country and region, applies the correct methodology (CDM ACM0002 for grid-connected solar, J-Credit methodology for Japan, VCS for voluntary markets), tracks vintages, and outputs a registry-ready data package. This is not a replacement for third-party verification -- it is the preparation step that makes verification faster, cheaper, and more consistent.

For investors, automated carbon and REC accounting transforms environmental attributes from an afterthought into a quantified, trackable component of total project returns.

3.3 Pluggable Financial Infrastructure

Solarix is deliberately not a financial platform. It does not issue securities, custody assets, or operate an exchange. Instead, the Solarix platform produces the evaluation intelligence that licensed financial partners consume.

This architecture means Solarix works with any licensed platform in any jurisdiction:

- **Singapore:** InvestaX (CMS + RMO licensed), ADDX (CMS licensed), or other MAS-regulated platforms
- **Korea:** Licensed securities firms operating under the Capital Markets Act (post-January 2027)
- **Japan:** Platforms operating under the Financial Instruments and Exchange Act
- **Global:** Any licensed entity that needs standardized project evaluation for renewable energy securities

The financial infrastructure is pluggable. The evaluation intelligence is the constant.

4. The Solarix Platform

4.1 Solarix Score

The Solarix Score is the platform's flagship product. It takes a renewable energy project submission and produces an investor-grade evaluation in hours rather than weeks.

Input. A project developer submits documentation to the platform: energy yield study (PDF), power purchase agreement terms, equipment specifications, permits and licenses, financial model (spreadsheet), and site coordinates. The system accepts partial submissions and flags missing documents.

Document extraction. A large language model layer extracts structured data from unstructured documents: PPA price, term, and offtaker credit rating; panel manufacturer, inverter model, and EPC contractor; permit status and grid connection timeline; IRR assumptions, capital expenditure, operating expenditure, and debt service coverage ratio. The extraction layer also identifies inconsistencies between documents -- for example, a yield study that assumes different irradiance values than the financial model.

External data enrichment. The platform cross-references extracted data against independent sources:

- **Solcast API** provides satellite-derived irradiance data at 90-meter resolution with 14-day forecasting capability. The platform compares the developer's yield claim against Solcast's independent estimate for the same site coordinates.
- **NASA POWER** provides free historical irradiance baselines at 50-kilometer resolution for initial screening.

- **Climatiq API** provides country-specific and region-specific grid emission factors for carbon displacement calculations.
- **Electricity Maps** provides real-time grid carbon intensity data across 160+ zones globally.

Scoring engine. Each of the six dimensions receives a score based on a combination of rules-based checks and LLM-assisted reasoning:

Dimension	Weight	What It Measures
Resource Quality	20%	Alignment between developer's yield study and independent irradiance data. P50/P90 benchmarks.
Technical Risk	20%	Equipment quality (Tier 1 manufacturers), EPC track record, grid interconnection risk, construction timeline.
Financial Viability	25%	Stress-tested IRR and DSCR against historical energy pricing and construction cost benchmarks. Monte Carlo sensitivity analysis.
Environmental Impact	15%	Actual carbon displacement based on local grid emission factor. Land use assessment.
Regulatory Compliance	10%	Permit completeness. Offering structure alignment with applicable securities frameworks.
Team Credibility	10%	Developer's prior project completion history. On-time and on-budget record. Regulatory flags.

Output. The Solarix Score (0-100) with a letter grade (AAA through C), a detailed evaluation report (PDF and JSON), and specific risk flags with recommendations.

The scoring methodology is transparent. Investors can see the weight of each dimension, the data sources used, and the reasoning behind each rating. This transparency is the foundation of institutional trust.

4.2 Carbon/REC Calculator

The Carbon/REC Calculator is a complementary product that quantifies the environmental attributes of renewable energy projects.

Input. Site location (latitude/longitude or country and grid region), installed capacity in kWp, and annual generation in kWh. Generation can be actual (from inverter data) or estimated (from capacity and location using Solcast).

Calculation engine. The system performs three calculations:

1. **Grid emission factor lookup.** Using Climatiq's database of country-specific and region-specific emission factors, supplemented by Electricity Maps real-time data and published government data (METI regional grid factors for Japan, KPX factors for Korea).
2. **Carbon offset calculation.** Annual generation (kWh) multiplied by the grid emission factor yields tonnes of CO2 equivalent avoided. The calculation is tagged with the appropriate methodology -- CDM ACM0002 for grid-connected renewable energy, J-Credit methodology for Japanese projects, or VCS methodology for voluntary market submissions.
3. **REC calculation.** Annual generation divided by 1,000 yields the number of RECs (1 REC = 1 MWh). Each REC is mapped to the appropriate registry -- I-REC for international markets, J-Credit for Japan, K-REC for Korea -- with estimated market values based on current trading prices.

Output. Annual carbon offset in tCO₂e, annual REC count, estimated carbon credit value (USD), estimated REC value (USD), methodology compliance report, and a registry-ready data package in JSON format.

The calculator is designed for repeated use. As a project accumulates operational data, the calculations become more precise -- moving from capacity-based estimates to actual generation data, with vintage tracking across years.

4.3 Delivery Formats

Both products are delivered through three channels:

- **REST API** for integration with STO platforms, investor dashboards, and third-party applications. Structured JSON responses enable automated workflows.
 - **Web dashboard** for interactive exploration of scores, reports, and calculations. Designed for investor presentations and partner demos.
 - **PDF report export** for inclusion in offering documents, investor packages, and regulatory filings.
-

5. How It Works

The end-to-end flow from physical energy asset to investor return follows five steps.

Step 1: Asset Partner Brings a Project

An energy company with operational or development-stage renewable energy assets -- solar farms, wind installations, or other clean energy infrastructure -- engages with the Solarix platform. The first asset partner is Univergy Solar K.K. (Japan), which operates over 200 solar plants across Japan through its Hinode joint venture.

The asset partner submits project documentation: yield studies, PPA terms, equipment specifications, permits, financial models, and site coordinates.

Step 2: Solarix Evaluates the Project

The Solarix platform processes the submission through its document extraction, external data enrichment, and scoring engine. Within hours, the platform produces:

- An Solarix Score (0-100) with letter grade
- A detailed evaluation report (PDF and JSON)
- Carbon offset calculations with methodology tagging
- REC quantification with registry mapping
- Specific risk flags and recommendations

This evaluation replaces or supplements the traditional consulting-based due diligence process. The output is standardized, reproducible, and machine-readable -- enabling direct integration into offering materials.

Step 3: Licensed Financial Partner Structures the Offering

A licensed financial platform -- operating under applicable securities regulation in the target jurisdiction -- uses the Solarix evaluation to structure a security token offering. The financial partner handles all regulated activities: securities issuance, KYC/AML verification, custody, and compliance.

Solarix provides the intelligence. The financial partner provides the regulated infrastructure. This separation is critical: it means Solarix can serve financial partners across multiple jurisdictions without itself requiring securities licenses.

Step 4: Investors Purchase Fractional Shares

Qualified investors purchase security tokens representing fractional ownership in the project's revenue streams. Tokenization lowers minimum investment thresholds from the \$1 million or more typical of traditional project finance to levels accessible to accredited investors, family offices, and smaller institutional allocators.

Security tokens are tradeable on the financial partner's licensed secondary market, providing liquidity that traditional project finance positions lack entirely.

Step 5: Yield Is Distributed to Investors

As the physical energy project operates, it generates revenue from three sources: electricity sales (under PPAs or at spot market rates), renewable energy certificate sales, and carbon credit monetization. Revenue flows through a project-level special purpose vehicle to security token holders on a pro-rata basis.

Solarix's Carbon/REC Calculator continuously tracks the environmental attributes generated by the project, quantifying carbon offsets and RECs as they accrue. This provides investors with transparent visibility into both the financial and environmental performance of their investment.

6. Market Opportunity

Solarix operates at the intersection of three large, rapidly growing markets.

6.1 The Renewable Energy Investment Gap

Global investment in renewable energy exceeded \$500 billion in 2024, according to BloombergNEF and the International Energy Agency, with total energy transition investment (including electrified transport, energy storage, and hydrogen) surpassing \$1.7 trillion. This trajectory reflects a structural shift: renewable energy is no longer an alternative investment category but the dominant source of new power generation capacity worldwide.

Solar photovoltaics account for the largest share of new capacity additions, with over 400 GW installed globally in 2024 alone. Module costs have fallen by more than 90% since 2010, and utility-scale solar now represents the cheapest source of new electricity generation in most geographies.

Despite the scale of investment, the capital gap remains substantial. The International Renewable Energy Agency (IRENA) estimates that annual renewable energy investment must reach \$1.3

trillion by 2030 to align with the 1.5-degree Celsius pathway. The gap between current investment and what is needed exceeds \$4.5 trillion cumulatively through 2030. Unlocking retail and non-institutional capital is essential to closing this gap, and tokenization provides the mechanism to do so.

6.2 The Voluntary Carbon Market

The voluntary carbon market is projected to grow from approximately \$2 billion in 2024 to \$10 billion to \$25 billion by 2030. The wide range reflects uncertainty about the pace of corporate net-zero commitment enforcement and verification standard adoption. What is not in dispute is the direction: tightening regulation, mandatory climate disclosure (the EU Corporate Sustainability Reporting Directive, the SEC's climate disclosure rules, and ISSB standards), and expanding compliance market scope all drive demand for high-quality carbon credits.

Renewable energy projects are a primary source of voluntary carbon credits. Accurate, methodology-compliant carbon accounting is therefore not a peripheral feature for energy investors -- it is a direct driver of returns.

6.3 Real-World Asset Tokenization

The tokenization of real-world assets has moved from theoretical exploration to active deployment. By the end of 2025, tokenized RWAs on public blockchains -- including tokenized treasuries, private credit, real estate, and commodities -- exceeded \$20 billion in total value, excluding stablecoins. McKinsey projects that tokenized financial assets could reach \$2 trillion by 2030 in a base case scenario, with more optimistic projections reaching \$4 trillion.

Several developments signal that energy infrastructure tokenization is entering its inflection point:

- **Mizuho Securities** tokenized solar power generation facilities in Japan, executing one of the first security token offerings for energy infrastructure in a major developed market.
- **MAS Project Guardian**, a Monetary Authority of Singapore-led initiative involving DBS, JPMorgan, Standard Chartered, and UBS, is actively promoting the tokenization of capital markets products.
- **Korea's Capital Markets Act amendments**, passed January 2026, create a regulated framework for security token offerings across all asset classes including project finance, with an estimated market size of KRW 367 trillion (\$249 billion) by 2030.

Energy infrastructure is particularly well-suited to tokenization: assets generate predictable, long-duration cash flows under contracted PPAs; environmental attributes (carbon credits, RECs)

provide additional revenue streams; and physical infrastructure provides tangible collateral that institutional investors understand.

6.4 Total Addressable Market

Solarix's revenue model captures value at the project evaluation layer. The addressable market is defined by the number and value of renewable energy projects that could benefit from standardized AI evaluation -- whether for STO issuance, institutional fundraising, or carbon credit preparation.

Market	2024 Size	2030 Projection	Solarix's Role
Renewable energy investment	\$500B/year	\$1.3T/year needed	Evaluate projects for tokenized fundraising
Voluntary carbon market	~\$2B	\$10-25B	Carbon accounting for project-level credits
RWA tokenization	\$20B+	\$2-4T	Evaluation intelligence for energy STOs
Green bond issuance	\$900B+	>\$1T	Project-level scoring for bond allocation

7. Business Model

Solarix generates revenue from project evaluation services and platform subscriptions. All fees are denominated and paid in fiat currency. There are no protocol tokens, staking mechanisms, or token-based fee structures.

7.1 Per-Project Evaluation Fees

Each project submitted to the Solarix platform for a full Solarix Score evaluation incurs a per-project fee. This fee covers document extraction, external data enrichment, scoring, and report generation. Pricing scales with project complexity and size.

Project Size	Evaluation Fee
Small (<10 MW)	\$2,000 - \$5,000
Medium (10-100 MW)	\$5,000 - \$15,000
Large (>100 MW)	\$15,000 - \$25,000

For context, comparable consulting-based due diligence from firms like DNV costs \$100,000 or more and takes six to eight weeks. The Solarix Score delivers a standardized evaluation in hours at 5-25% of the cost.

7.2 SaaS Platform Subscription

Ongoing access to the Solarix dashboard, Carbon/REC Calculator, and performance monitoring is offered on a monthly subscription basis.

Tier	Monthly Fee	Includes
Standard	\$500 - \$1,000	Carbon/REC Calculator for up to 10 projects, dashboard access
Professional	\$1,000 - \$2,000	Unlimited Carbon/REC calculations, API access, performance monitoring
Enterprise	Custom	Full platform access, white-label reports, dedicated support, SLA

7.3 Brand License

The Solarix brand, domain (solarix.marinachain.io), and visual identity are available under license to operating entities that wish to market renewable energy investment products under the Solarix name. This is a one-time negotiated fee that grants irrevocable usage rights.

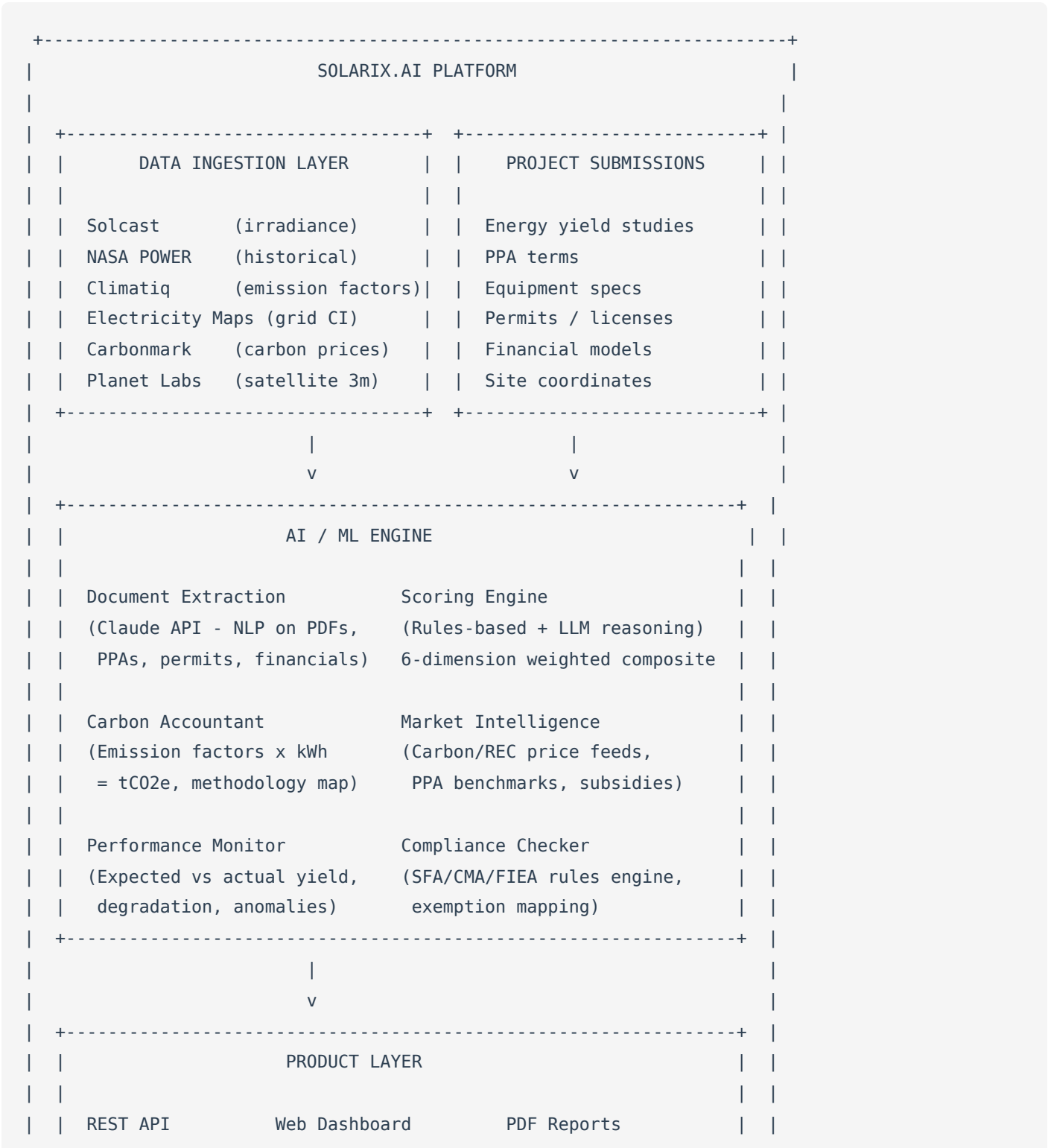
7.4 What Solarix Does Not Charge For

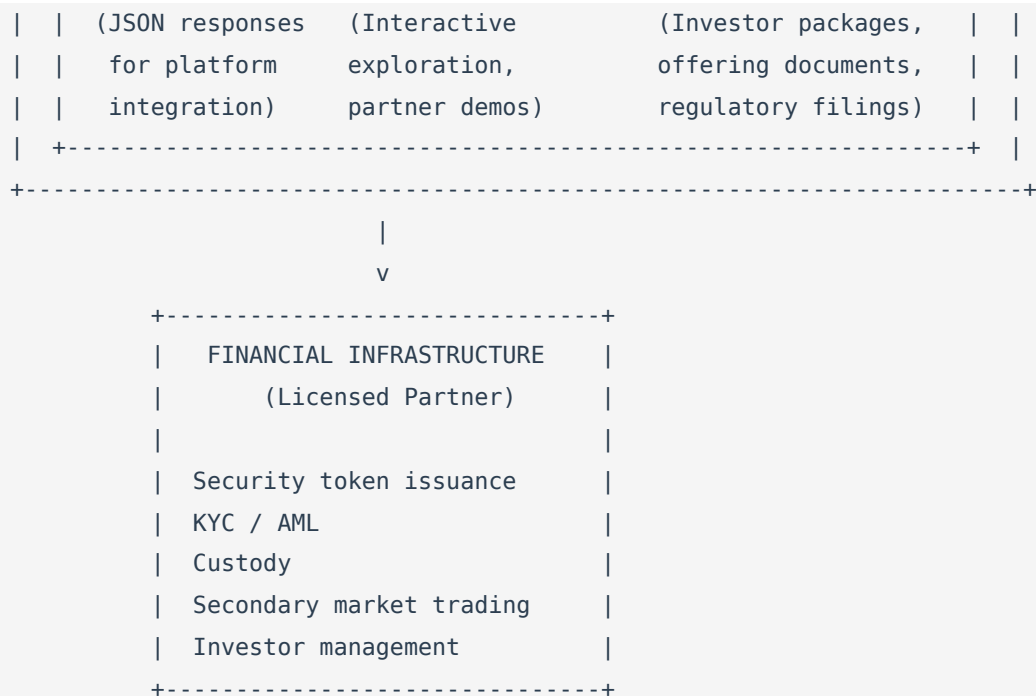
Solarix does not collect issuance fees, management fees, performance fees, or trading commissions. Those revenue streams belong to the financial infrastructure partner that handles securities issuance and investor management. Solarix's revenue is earned entirely from the intelligence layer: evaluation, analytics, and monitoring.

This clean separation avoids conflicts of interest. Solarix's incentive is to produce accurate, trustworthy evaluations -- not to maximize the number or size of offerings.

8. Technology Architecture

8.1 System Overview





8.2 Core Stack

The Solarix platform is built on proven, production-grade technology:

- **Backend:** Python 3.12, FastAPI (async, high-performance API framework)
- **AI Layer:** Anthropic Claude API for document extraction and NLP on unstructured project documents (PPAs, permits, yield studies, financial models)
- **Database:** PostgreSQL with TimescaleDB extension for time-series operational data
- **Caching:** Redis for API response caching (satellite irradiance data is stable over hours; caching reduces cost and latency)
- **PDF Generation:** WeasyPrint for high-quality evaluation report rendering
- **Frontend Dashboard:** React/Next.js with server-side rendering

8.3 External Data Integrations

The platform's evaluation quality depends on the breadth and reliability of its external data sources. All integrations use official APIs with documented rate limits, error handling, and fallback strategies.

Solar resource data. Solcast provides DNV-owned, satellite-derived irradiance data at 90-meter spatial resolution with global coverage. The platform uses Solcast's Typical Meteorological Year (TMY) dataset for baseline resource assessment and 14-day forecast data for operational monitoring. NASA POWER provides free historical irradiance at 50-kilometer resolution as a screening layer and independent cross-reference.

Carbon and emissions data. ClimaTiq provides GHG Protocol-compliant emission factors across 149 countries, enabling country-specific and region-specific carbon displacement calculations. Electricity Maps provides real-time grid carbon intensity across 160+ electricity zones, supporting dynamic carbon accounting that reflects actual grid conditions rather than annual averages.

Carbon market data. Carbonmark provides on-chain carbon credit market pricing for voluntary market valuation. Compliance market pricing (EU ETS, K-ETS, Japan GX-ETS) is sourced from published exchange data.

Satellite imagery. Planet Labs provides 3-meter daily satellite imagery for vegetation encroachment detection, soiling assessment, and physical site verification. This is used in the performance monitoring module for operational projects.

8.4 Security and Data Handling

Project submissions contain confidential financial and commercial information. The platform implements:

- End-to-end encryption for all data in transit (TLS 1.3) and at rest (AES-256)
- Role-based access control with per-project permissions
- Audit logging of all data access and evaluation runs
- Data retention policies aligned with financial services requirements
- No training of AI models on customer data without explicit consent

8.5 Scalability

The architecture is designed for horizontal scaling. The API layer, scoring engine, and document extraction pipeline operate as independent services that can be scaled independently based on demand. The most compute-intensive operations -- LLM-based document extraction and Monte Carlo financial simulations -- are parallelizable and benefit from GPU acceleration where available.

9. Regulatory Context

9.1 Security Token Offerings Are Regulated Securities

A security token offering is the issuance of a digital security -- a token on a blockchain that represents an ownership stake, revenue share, or debt obligation in a real-world asset. The critical distinction: STOs are regulated under existing securities law. They are not a new asset class, a

form of cryptocurrency, or a DeFi instrument. They are securities that happen to use blockchain as a settlement and recording layer.

This distinction matters because it determines the regulatory regime. STOs fall under the same investor protection frameworks that govern stocks, bonds, and fund shares. They require prospectuses or qualifying exemptions, KYC/AML verification, licensed intermediaries for issuance and trading, and ongoing disclosure obligations.

Solarix operates within this regulated paradigm. The platform provides evaluation intelligence to licensed financial partners who handle all regulated activities. At no point does Solarix issue, distribute, custody, or trade securities.

9.2 Singapore: The Launch Jurisdiction

Singapore is the recommended first jurisdiction for Solarix-evaluated offerings, for several reasons.

Mature regulatory framework. MAS takes a "same activity, same risk, same regulation" approach. If a token has security features, it is regulated as a capital markets product under the Securities and Futures Act (SFA). No special legislation was required -- existing securities law applies.

Prospectus exemptions enable immediate launch. The SFA provides four exemptions from full prospectus requirements:

Exemption	Condition
Small Offering	Raise no more than S\$5 million (~US\$3.7M) in 12 months
Private Placement	No more than 50 persons in 12 months
Accredited Investors	Net assets > S\$2M, or financial assets > S\$1M, or income > S\$300K/year
Institutional Investors	Banks, insurers, pension funds, CMS license holders

An accredited investor exemption allows an offering to launch without a full prospectus -- reducing time-to-market from months to weeks while maintaining full investor protection.

Licensed platforms are already operational. InvestaX holds both CMS and RMO licenses from MAS and operates a fully functional tokenization SaaS platform with issuance, trading, and custody

capabilities. ADDX holds a CMS license and has expanded into white-label institutional technology solutions. These platforms are ready to consume Solarix's evaluation intelligence today.

MAS is actively promoting tokenization. Project Guardian, a MAS-led collaborative initiative involving DBS, JPMorgan, Standard Chartered, and UBS, explores the tokenization of financial assets across foreign exchange, fixed income, and asset management. In 2026, MAS commenced a trial of tokenized government bills using wholesale CBDC. The regulatory signal is unambiguous.

Foreign assets are welcome. Singapore's technology-neutral approach places no restrictions on the geographic location of underlying assets. Univergy's Japanese solar farms can serve as the underlying assets for a Singapore-issued security token offering without jurisdictional conflict.

9.3 Korea: The Second Market

Korea's National Assembly passed amendments to both the Capital Markets Act and the Electronic Securities Act on January 15, 2026. These amendments permit tokenized securities to be issued and traded through licensed brokerages and registered on Korea Securities Depository infrastructure. The framework becomes effective in January 2027 after a 12-month preparation period.

Key characteristics of the Korean framework:

- **Scope:** All types of securities -- debt, equity, and investment contracts. Deliberately broad asset eligibility including real estate, project finance, and bonds.
- **Classification:** Security tokens are classified as **regulated securities** under the Capital Markets Act, **not** as virtual assets or cryptocurrency. They are governed by traditional financial regulation, not the Virtual Asset User Protection Act.
- **Market size:** BCG projects the Korean STO market reaching KRW 367 trillion (\$249 billion) by 2030.
- **Key players:** Mirae Asset Securities, Hana Financial Group, Kasa Korea, Lucentblock, and Funble are building STO infrastructure.
- **Regulatory body:** A public-private consultative body was launched in February 2026 to coordinate framework implementation.

The classification distinction is critical. STOs in Korea operate within traditional securities regulation, with full investor protection, licensed intermediaries, and regulatory oversight. This is the opposite of the unregulated token sales that characterized the 2017-2018 ICO era.

Korea represents a substantial second market for Solarix-evaluated offerings. By launching first in Singapore and building a track record, Solarix can enter the Korean market in 2027 with

demonstrated credibility.

9.4 What This Means for Solarix

Solarix's position in the regulatory landscape is straightforward:

- Solarix is a **software platform** that produces project evaluations, carbon accounting, and analytics. It is not a financial service.
- Securities issuance, trading, and custody are handled by **licensed financial partners** in each jurisdiction.
- Solarix has **no role** in the offer, sale, or distribution of securities to investors.
- Solarix's outputs (scores, reports, calculations) are **informational products** consumed by financial professionals, comparable to credit ratings or research reports.

This positioning means Solarix does not require securities licenses to operate. It generates revenue from software services, not from financial intermediation.

10. Team and Partners

10.1 Technology: MarinaChain Pte. Ltd.

The Solarix platform is built and maintained by MarinaChain Pte. Ltd., a Singapore-registered climatetech company (71 Ayer Rajah Crescent, Singapore). MarinaChain specializes in AI-powered solutions for the energy and maritime sectors, with engineering capabilities in large language model applications, geospatial data processing, and real-time analytics platforms.

MarinaChain participates in Korean government R&D programs, including TIPS and the Chogyukcha (Super-Gap) deep-tech initiative targeting AI and green technology sectors. This backing provides independent validation of MarinaChain's technical capabilities and climatetech domain expertise.

MarinaChain's role is that of a technology vendor. MarinaChain licenses the Solarix software platform on a SaaS basis, provides carbon accounting methodology as intellectual property, and offers technical advisory services. MarinaChain holds no equity in the Solarix operating entity, receives no securities or tokens, holds no board seats, and is not named in any offering documents or prospectuses. Standard vendor limitation of liability applies, with the Solarix entity providing full indemnification against investor claims.

The relationship is governed by three agreements:

1. **Brand License Agreement** -- irrevocable license to the Solarix name, solarix.marinachain.io domain, and visual identity.
2. **SaaS Agreement** -- recurring license for Solarix Score API, Carbon/REC Calculator API, and platform infrastructure.
3. **Marketing Rights Agreement** -- mutual usage rights. Solarix may state "Technology powered by MarinaChain." MarinaChain may state "Creator of the Solarix platform." Explicit clause: MarinaChain is a technology vendor with no fiduciary duty to investors in Solarix-branded financial products.

10.2 Asset Partner: Univergy Solar K.K.

Univergy Solar K.K. is a Japanese renewable energy company with a portfolio of over 200 operational solar plants across Japan, operated through its Hinode joint venture. Univergy serves as the first asset partner for Solarix-evaluated security token offerings, providing the underlying physical energy infrastructure.

Univergy's portfolio of operational, revenue-generating solar assets makes it an ideal launch partner: the projects produce real electricity revenue under contracted PPAs, generate quantifiable carbon offsets and RECs, and have established operational track records that the Solarix Score can evaluate against independent data.

10.3 Financial Infrastructure: Pluggable

The financial infrastructure partner for the initial Singapore offering has not yet been publicly announced. The platform architecture is designed to work with any licensed partner, including but not limited to InvestaX, ADDX, or other MAS-regulated entities.

One potential infrastructure partner under evaluation is EnergyToken, a three-pillar structure comprising a non-profit foundation (Cayman), a management company (Singapore), and a Variable Capital Company fund (Singapore, pursuing MAS licensing). EnergyToken's structure is designed specifically for channeling capital into renewable energy assets through regulated fund vehicles and tokenized distribution. If engaged, EnergyToken would handle fund management, investor relations, and token issuance -- consuming Solarix's evaluation intelligence as an input to its investment process.

The selection of financial infrastructure partner is a decision for the Solarix operating entity, not for MarinaChain. The platform's pluggable architecture ensures that this choice does not constrain future market expansion.

11. Roadmap

Phase 1: MVP and First Projects (5 months)

Objective: Deliver a working Solarix Score and Carbon/REC Calculator, evaluate the first Univergy solar projects, and produce sample reports for investor presentations.

- Build Solarix Score MVP: document extraction, external data integration (Solcast, NASA POWER, Climatiq, Electricity Maps), scoring engine, PDF report generation
- Build Carbon/REC Calculator: emission factor lookup, methodology mapping (CDM ACM0002, J-Credit, VCS), registry-ready output
- Evaluate 3-5 Univergy solar plants to produce demonstration Solarix Score reports
- Web dashboard for interactive exploration of scores and calculations
- Finalize legal agreements (brand license, SaaS, marketing rights)
- Select and onboard financial infrastructure partner in Singapore

Deliverable: Live Solarix platform with demonstration evaluations. Investor-ready materials for first STO.

Phase 2: Monitoring and Operations (3 months)

Objective: Add post-investment performance monitoring for operational projects.

- SCADA/inverter API integration for real-time generation data (SMA Sunny Portal, Huawei FusionSolar, SolarEdge)
- Expected vs. actual yield comparison using Solcast forecast data
- Anomaly detection (underperformance, degradation, revenue deviation)
- Automated monthly investor reports (PDF generation)
- Alert system for material anomalies (email, webhook)

Deliverable: Real-time investor dashboard with automated reporting for the first tranche of tokenized projects.

Phase 3: Scale (ongoing)

Objective: Expand beyond Univergy to additional asset partners, energy types, and jurisdictions.

- Onboard non-Univergy renewable energy projects (wind, hydro, other solar developers)
- Add compliance engine for multi-jurisdiction offering validation (SFA, CMA, FIEA rules)

- Market intelligence module (carbon price feeds, REC pricing, PPA benchmarks, subsidy databases)
- Korea market entry when CMA framework goes live (January 2027)
- API partnerships with additional STO platforms
- Satellite imagery integration (Planet Labs) for physical site monitoring

Deliverable: Full-featured platform serving multiple issuers across Singapore and Korea, with expansion capability to additional jurisdictions.

12. Appendix: Data Sources and References

Production-Ready API Integrations

Service	Use Case	Documentation	Pricing
Solcast	Satellite-derived irradiance, yield forecasting (90m resolution, DNV-owned)	docs.solcast.com.au	~\$1,000/year
NASA POWER	Historical irradiance baseline, screening (50km resolution)	power.larc.nasa.gov/docs	Free, unlimited
PVGIS	PV yield estimates (Europe-focused, EU Joint Research Centre)	re.jrc.ec.europa.eu	Free
Climatiq	GHG Protocol-compliant emission factors, 149 countries	climatiq.io/docs	Freemium
Electricity Maps	Real-time grid carbon intensity, 160+ zones	electricitymaps.com	Freemium
Planet Labs	Daily satellite imagery, 3m resolution (vegetation, soiling)	docs.planet.com	Pay-per-use
Carbonmark	On-chain carbon credit market pricing	docs.carbonmark.com	Free

Planned Integrations

Service	Use Case	Timeline
Verra Next-Gen Registry API	Programmatic credit transfer and retirement (with S&P Global)	2026
SolarAnywhere Monitoring API	O&M performance data for US-based projects	2026
Inverter APIs (SMA, Huawei, SolarEdge)	Real-time generation data for performance monitoring	Phase 2

Manual or Scraper-Based Sources

Source	Use Case	Access Method
J-Credit Registry (Japan)	Japanese carbon credit verification and pricing	Manual / KlimaDAO bridge
K-ETS Registry (Korea)	Korean carbon credit verification and pricing	Korea Data Portal / manual
I-REC Registry	International REC tracking and verification	Manual / broker API
JEPX / KPX spot prices	Energy market pricing (Japan / Korea)	Web scraping

Competitive Reference: Carbon Rating Providers

Company	Focus	Relevance
Sylvera	Carbon credit ratings, geospatial MRV	Comparable per-asset scoring model; Solarix applies similar approach to project equity
BeZero Carbon	Project-level carbon ratings, API to LSEG/ICE	Validates market demand for per-project evaluation; valued at \$100M+
Calyx Global	1,050+ GHG ratings, Bloomberg integration	Demonstrates institutional appetite for standardized environmental scoring

Competitive Reference: Renewable Energy Platforms

Company	Focus	Gap Solarix Fills
DNV	Technical due diligence (consulting)	6-8 weeks, \$100K+ per engagement; Solarix delivers in hours at fraction of cost
PowerFactors	Operational monitoring (600+ customers)	Post-acquisition only; Solarix covers pre-investment evaluation
Wood Mackenzie	Market intelligence and research	Research reports, not per-project AI scoring
Solargis / Solcast	Solar resource data	Raw data; Solarix synthesizes into investment-grade evaluation

STO Infrastructure Reference

Platform	Licenses	Jurisdiction
InvestaX	CMS + RMO (MAS)	Singapore
ADDX	CMS (MAS)	Singapore
DigiFT	RMO + CMS (MAS)	Singapore
Mirae Asset Securities	Full securities license	Korea (building STO platform)
Hana Financial Group	Full securities license	Korea (building STO platform)

Regulatory Sources

- MAS Guide on Tokenisation of Capital Markets Products (revised 2025)
 - Singapore Securities and Futures Act (SFA)
 - Korea Capital Markets Act amendments (passed January 15, 2026, effective January 2027)
 - Korea Electronic Securities Act amendments (passed January 15, 2026)
 - MAS Project Guardian initiative documentation
 - Korea Financial Services Commission public-private consultative body (established February 2026)
-

Technology powered by MarinaChain Pte. Ltd.

For inquiries: solarix.marinachain.io

This document is for informational purposes only and does not constitute an offer to sell or a solicitation of an offer to buy any securities. Any securities offering will be made only pursuant to applicable laws and regulations through licensed financial intermediaries.

March 2026