

SIAM INDUSTRIAL GROUP (SIG)

Board Climate Scenario Governance — Management Submission to Committee

Director's Briefing | Thai Institute of Directors | Board Working Session

Purpose of this document. Senior management has completed the climate-related scenario analysis required under IFRS S2 — sensitivity analysis, scenario selection, financial modeling, and resilience assessment. This document presents management's findings and recommendations to the Board's designated committee for review, challenge, and decision. It is the basis for the committee deliberation in today's working session.

Note: SIG is a hypothetical company. All figures are illustrative but calibrated to realistic orders of magnitude for a large Thai industrial conglomerate, and are designed to withstand governance, audit, and reasonableness scrutiny under IFRS S2.

1 THE COMPANY AT A GLANCE

SIG is Thailand's largest industrial conglomerate — a vertically integrated leader in cement and building materials, petrochemicals, and packaging. Its core processes involve chemical transformation (cement calcination and petrochemical cracking) where carbon dioxide is an unavoidable by-product of the reaction itself, not merely the energy used. SIG is a classic hard-to-abate industrial company: it cannot fuel-switch its way out of its process emissions.

Revenue (FY2025)	฿600 billion	Employees	40,000 across Thailand
EBITDA (FY2025)	฿85 billion (~14% margin)	Outstanding debt	~฿300 billion
Net profit (baseline)	฿45 billion	Plant & facility asset base	~฿120 billion
Market capitalization	~฿810 billion (P/E ~18x)	EU export revenue	~฿90 billion (~15% of revenue)
Map Ta Phut complex	32% of group EBITDA = ฿27.2B	Trailing valuation	P/E ~18x; EV/EBITDA ~13x

2 GREENHOUSE GAS BASELINE — FY2025

Established via the GHG Reporting Platform by the Department of Climate Change and Environment (DCCE). **Scope 1+2 combined (50 million tCO₂e) is the directly priced base for all carbon expense calculations.**

Emissions Scope	tCO ₂ e	Share	Note
Scope 1 — Direct	~45 million	~18%	Calcination, cracking, captive power. Directly priced under ETS.
Scope 2 — Purchased energy	~5 million	~2%	Manufacturing, logistics, data centers.
Scope 3 — Value chain	~200 million	~80%	Raw materials, transport, product use. EU CBAM exposure.

Emissions Scope	tCO ₂ e	Share	Note
SCOPE 1+2 PRICED BASE	50 million	20%	Every ฿100/tCO ₂ e = ฿5B annual carbon cost.

Assurance note: Under the Thai SEC’s ISSB-aligned disclosure roadmap, Scope 1 and Scope 2 GHG disclosures will require limited assurance — provided either by verifiers registered with the Thailand Greenhouse Gas Management Organization (TGO) or by providers applying internationally recognized assurance standards. The baseline above is the data set that assurance will test. The board should know, before approving any climate disclosure, whether SIG’s emissions data as reported would withstand limited assurance today.

3 MANAGEMENT’S SCENARIO SELECTION

IFRS S2 (paragraph 22) requires an entity to use climate-related scenario analysis to assess its climate resilience, using an approach commensurate with the entity’s circumstances. The standard does not prescribe a minimum number or type of scenarios; consistent with TCFD guidance and emerging regulatory expectations, management selected scenarios spanning both transition-led and physical-led futures relevant to SIG’s specific circumstances. **Management selected three scenarios:**

Scenario	Framework	Why management selected it
Current Policies (BAU)	NGFS Current Policies / IPCC SSP3-7.0	Hot house world. Carbon tax holds at ฿200/t (Thai Act Ch.10). Transition cost limited to the tax floor — but physical damage accumulates unmitigated under ~3.6°C warming.
Net Zero 2050 (Orderly)	NGFS Net Zero 2050 / IPCC SSP1-2.6	Orderly transition. Aggressive but predictable carbon pricing, climbing steadily and visibly, giving SIG time to adapt. Warming constrained to ~1.8°C limits physical damage.
Delayed Transition (Disorderly)	NGFS Delayed Transition / IPCC SSP2-4.5	Disorderly transition. Policy delays, then shocks. Carbon price stays low, then jumps abruptly. Physical damage accumulates during the delay (~2.7°C), so SIG is hit by transition shock and physical damage simultaneously.

Why Net Zero 2050 and Delayed Transition together. Net Zero 2050 tests SIG under a world that succeeds in going green — the question is whether a hard-to-abate cement company can survive aggressive carbon pricing. Delayed Transition tests the opposite — a world that delays, then panics. The two differ in both path and destination: Net Zero 2050 ramps gradually and gives time to adapt; Delayed Transition stays near the floor, then shocks higher than the orderly long-term price (compressed catch-up requires higher marginal abatement cost) and layers physical damage on top of the transition shock.

Note the deliberate inversion: Current Policies carry the lowest transition cost but the highest physical warming (SSP3-7.0, ~3.6°C) — nothing is done, so carbon stays cheap while the planet heats. Delayed Transition is the worst financially because the late policy shock and accumulated physical damage strike at once.

Scenario-pairing note: NGFS itself models Delayed Transition at ~1.7°C and Current Policies at ~2.9°C end-of-century warming. Management deliberately paired each transition pathway with a higher-warming IPCC physical pathway (SSP2-4.5 and SSP3-7.0 respectively) as a conservative design choice — capturing adaptation underinvestment, insurance withdrawal, and compounding hazards in a disorderly or unmitigated world. This pairing is disclosed as a methodological choice, not an NGFS output.

4 CARBON PRICE ASSUMPTIONS BY TIME HORIZON

All short-term prices are anchored to Thailand's ฿200/tCO₂e carbon price. Important framing: the ฿200/t price is in force today only as a restructuring of the petroleum excise tax on oil and petroleum products — it is price-neutral and does not yet reach SIG's industrial process emissions. Management applies ฿200/t to the full Scope 1+2 base as a deliberate, disclosed proxy for economy-wide coverage under the carbon tax and ETS chapters of the draft Thai Climate Change Act — a modeling assumption, not current law. Medium and long-term prices follow the ETS trajectory under Chapter 8 of the draft Act. **Prices are deliberately moderated to realistic Thai policy levels — not theoretical NGFS shadow prices.**

Scenario	Short (<3 yr)	Medium (3–10 yr)	Long (>10 yr)
Current Policies (BAU)	฿200/t	฿200/t	฿200/t
Net Zero 2050 (Orderly)	฿200/t	฿400/t	฿1,000/t
Delayed Transition (Disorderly)	฿200/t	฿250/t (delay continues)	฿1,500/t (compressed shock)

Net Zero 2050 ramps predictably from ฿200/t through ฿400/t to ฿1,000/t over 25 years — visible, hedgeable, contractable. Delayed Transition stays near the floor (฿250/t) through the late 2020s and then shocks to ฿1,500/t in a compressed 2–3 year window once policy scrambles to catch up. The higher long-term destination is a feature of the delay, not an assumption: achieving the same cumulative emissions cut in less time requires a higher marginal abatement cost (NGFS Phase 4). The asymmetry on the way there matters more than the destination — in the orderly path SIG has time to reprice long-dated contracts, hedge carbon exposure, raise abatement capital, and build CCS at scheduled cost; in the disorderly path contracts are locked at pre-shock prices, hedges are unavailable (the market shocks simultaneously), and abatement equipment prices spike. Same tons priced, very different margin outcome.

5 FINDING 1 — TRANSITION RISK ON THE INCOME STATEMENT

Carbon expense is an operating cost. It reduces EBITDA, then flows through depreciation, interest, and tax to net income. **Management modeled the full income statement at each carbon price.**

BASELINE INCOME STATEMENT STRUCTURE

Revenue	฿600.0B
EBITDA (14.2% margin)	฿85.0B
less Depreciation & amortization	(฿15.0B)
= EBIT	฿70.0B
less Interest (~4.6% on ฿300B debt)	(฿13.75B)

= Pre-tax profit	฿56.25B
less Tax (Thai corporate rate 20%)	(฿11.25B)
= Net profit (baseline)	฿45.0B

CARBON EXPENSE IMPACT ACROSS HORIZONS

Horizon	Carbon Price	Carbon Expense	Adj. EBITDA	Net Income
BAU / Short term	฿200/t	฿10B	฿75B (12.5%)	฿37B
Medium term	฿400/t	฿20B	฿65B (10.8%)	฿29B
Long term	฿1,000/t	฿50B	฿35B (5.8%)	฿5B
Long term — shock peak (Delayed Transition)	฿1,500/t	฿75B	฿10B (1.7%)	(฿18.75B)

Table note: the first three rows trace the orderly Net Zero 2050 path (carbon price rising ฿200 → ฿400 → ฿1,000/t). The fourth row is the Delayed Transition shock peak (฿1,500/t) — an alternative long-term path, not a fourth time horizon. Carbon expense = Scope 1+2 (50M tCO_{2e}) × carbon price; the cascade to net income runs through the baseline income-statement structure above (less D&A, interest, and tax; a pre-tax loss carries no tax charge).

The real finding is margin compression, not insolvency. SIG's net margin falls from 7.5% to under 1% by the long term. On the orderly Net Zero 2050 path the company remains marginally profitable and is not a going concern in distress — EBITDA stays positive at ฿35B even at ฿1,000/t — but shareholder returns are progressively consumed by carbon cost. The disorderly shock peak (fourth, row, below) is the more severe case and is examined separately. This is the financial reality the board must govern.

Sensitivity — Delayed Transition compressed shock. The fourth row of the table above isolates the Delayed Transition compressed-shock peak (฿1,500/t for a 2–3 year window). At that price, nominal carbon expense reaches ~฿75B, Adjusted EBITDA compresses to ~฿10B (a 1.7% margin), EBIT swings to roughly –฿5B, and net income to approximately –฿18.75B before any passthrough or mitigation. These are nominal, pre-mitigation figures: partial passthrough is constrained because the shock hits all market participants simultaneously, removing pricing power and hedge availability, but abatement capacity, contract repricing, and capital reallocation absorb part of the impact as the company catches up. This is a severe earnings shock, not automatically an insolvency event: the –฿18.75B net loss is struck after ฿15B of non-cash depreciation and amortization, so SIG remains cash-generative at the operating line even in the shock window. But whether the company absorbs it without distress depends on its equity base, liquidity, and debt covenants — which the board must examine, not assume. One figure demands attention: EBIT of –฿5B against ฿13.75B of interest means interest coverage turns negative in the shock window, a condition that can trigger covenant review. A single 2–3 year window can swing earnings by roughly ฿64 billion a year versus baseline (from +฿45B to –฿18.75B), and the board's job is to confirm the balance sheet and financing structure can carry that loss. The case for orderly transition is precisely this: not lower lifetime cost, but lower peak operating risk and the ability to choose when and how the company absorbs it.

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EU CBAM — A MARGIN CHARGE ON EU EXPORTS

The EU Carbon Border Adjustment Mechanism entered its definitive phase on 1 January 2026, requiring importers to buy certificates for the embedded emissions of covered goods. Fully phased in (as EU free allowances reach zero by 2034), it imposes an estimated ฿6.3 billion annual charge against SIG's ฿90B EU export business — equivalent to 7% of EU export revenue and 1.05% of total revenue. This is not an additive standalone cost: it is a charge against the EU export business that compresses its margin, and on a normal export-margin base it would erode a substantial share of that book's profitability. The charge phases in over time — in 2026 only a small fraction applies, because roughly 97.5% of EU free allocation remains in force this year. Definitive-regime coverage includes cement, iron and steel, aluminum, fertilizers, electricity, and hydrogen; SIG's exposure runs through its cementitious and clinker exports. Exposure on chemical and packaging exports is contingent on the EU's proposed scope extension (proposed from 2028) and is treated as upside risk, not base case.

STRANDED ASSET CHECK — ISAN CLINKER KILNS 1 & 2

The kilns carry a 30-year asset life in the financial statements. Each ton of clinker earns a ฿400 operating margin and emits 0.83 tCO₂e. Economic stranding occurs when the carbon cost of producing a ton of clinker exceeds that margin — which happens at a carbon price of ฿480/tCO₂e (฿400 margin ÷ 0.83 tCO₂e per ton).

Under the moderated trajectory, the kilns stay viable through the medium term: at ฿400/tCO₂e, the carbon cost is ฿332 per ton of clinker, still inside the ฿400 margin. They cross the stranding threshold in the long term: at ฿1,000/tCO₂e, the carbon cost rises to ฿830 per ton — a ฿430 loss on every ton produced.

A scenario implying stranding before the stated 30-year asset life ends triggers a consistency disclosure under IFRS S1's connected-information requirements (paragraphs 21–24): data and assumptions in sustainability disclosures must be consistent, to the extent possible, with those used in the related financial statements. Either the inconsistency is disclosed, or the asset life and impairment assumptions are updated under IAS 16 and IAS 36.

6 FINDING 2 — PHYSICAL RISK ON THE BALANCE SHEET

Physical risk creates two separate accounting impacts: business interruption (income statement) and asset impairment (balance sheet). IFRS S2 requires disclosure of the current and anticipated financial effects of climate-related risks (paragraphs 15–16) and, among cross-industry metrics, the amount and percentage of assets vulnerable to climate-related physical risks (paragraph 29(c)). These figures are driven by physical hazard, not carbon price, and therefore differ between Net Zero 2050 (constrained warming, SSP1-2.6) and Delayed Transition (accumulated damage, SSP2-4.5).

Component	Net Zero 2050 (SSP1-2.6)	Delayed Transition (SSP2-4.5)
Business interruption — Bangkok hub flood	Immaterial — excluded from total	฿225M (3 events × ฿150M × 50% net)
Asset impairment severity	3% (SSP1-2.6, ~1.8°C constrained)	8% (SSP2-4.5, disorderly + delay)
Asset impairment write-down (× ฿120B base)	฿3.6B	฿9.6B
TOTAL VALUE AT RISK	฿3.6B	฿9.825B

The Bangkok hub is a headquarters and data center, not a production facility — a flood disrupts management and data functions (reroutable within 48 hours) but does not stop cement production, which occurs at the Isan kilns. This is why the business interruption figure (฿225M) is modest relative to the asset impairment exposure.

Why the table shows orderly and disorderly — and what Current Policies (BAU) costs on the other side of the inversion. The actionable board choice is between Net Zero 2050 and Delayed Transition — both involve a deliberate path. Current Policies (BAU) is not a defensible board position; it is what happens if the company decides not to decide. For completeness, BAU corresponds to SSP3-7.0 (~3.6°C end-of-century) and carries the worst physical exposure of the three pathways: storm frequency roughly 1.5–2x current on the Bangkok hub, drought severity higher and more chronic in the Isan region where the kilns sit, and rising labor productivity loss and cooling cost across the industrial base. Quantified on the same asset base: business interruption ~฿450M (more frequent flood events) and asset impairment severity of 10–12% (industrial-asset benchmark for tropical regions under 3–4°C warming, IPCC AR6 / NGFS Phase 4) — implying total physical Value at Risk of roughly ฿12–15B, materially worse than Delayed Transition. This closes the deliberate inversion: BAU is cheapest on transition (฿10B annual carbon expense, no shock) but the most expensive on physics (~฿12–15B physical Value at Risk plus chronic productivity drag the model has not yet quantified). The board cannot evaluate the orderly–disorderly choice in isolation; the "do nothing" pathway has the highest aggregate cost, distributed differently across the income statement and balance sheet.

7 FINDING 3 — MANAGEMENT'S RESILIENCE ASSESSMENT

IFRS S2 does not require disclosure of the scenario analysis itself — it requires disclosure of what the results mean for SIG's resilience. **Management's assessment has three required elements:**

Strategic implications & required adjustment	SIG's hard-to-abate process emissions cannot be eliminated by fuel switching. The business model is viable through the medium term but faces material margin compression and clinker stranding in the long term without transformation. Required adjustments: carbon capture (CCS) feasibility, clinker substitution, renewable energy procurement, and green product lines.
Significant areas of uncertainty	The dominant variable is the Thai ETS free-allocation phase-down timeline (Net Zero 2050) and the timing/magnitude of the policy shock (Delayed Transition). A ฿100/t variance shifts annual carbon expense by ฿5B. Physical risk accumulation during any delay period increases asset impairment simultaneously.
Capacity to adapt over time	Short term: strong — carbon cost absorbable, ฿37B net income retained. Medium term: adequate — margin compression manageable with disciplined capital allocation. Long term: conditional — requires committed abatement investment and adaptation capital now to preserve viability.

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ADAPTATION CAPITAL — MANAGEMENT RECOMMENDATION

Management recommends a ฿4 billion group physical adaptation program (flood berms, elevated substations, water recycling) across the Bangkok hub and Northeast facilities, with **฿500 million as an immediate Phase 1 tranche** for Bangkok hub flood defense.

Program cost	฿4.0B (3.3% of ฿120B asset base)
Value at risk protected (Delayed Transition)	฿9.825B
Protection ratio	฿2.46 of value protected per ฿1 spent
Phase 1 — immediate approval	฿500M Bangkok hub flood defense
Management recommendation	APPROVE

Honest scope note: the ฿4B program reduces the severity of specific hazards at specific sites — it does not eliminate the full ฿9.6B exposure. The ฿2.46 protection ratio is the decision framework; engineering validation of facility-by-facility coverage is the next step. The board approves the framework; the engineers validate the coverage.

8 FINDING 4 — VALUATION RISK & GREEN OPPORTUNITY**P/E COMPRESSION RISK****฿90–180 billion**

SIG trades at ~18x today (฿810B market cap / ฿45B net profit). Failure to demonstrate quantified climate resilience risks a de-rate to 14–16x — equity value compression of ฿90B at 16x or ฿180B at 14x, without any change in current earnings. Three forces drive the de-rate: investors apply a higher discount rate to companies with unmanaged climate risk because the range of plausible future cash flows widens; FTSE Russell ESG Scores — now SET's primary rating standard, with USD 20 trillion of capital benchmarked to FTSE Russell indices — feed directly into index weighting, so weak disclosure translates into passive outflows independent of fundamentals; and lenders are pricing transition risk into credit spreads on SIG's ฿300B debt, raising the weighted cost of capital and compressing equity value through standard DCF mechanics. None of these levers is theoretical — each is observable in industrial-sector peer trading data today.

GREEN OPPORTUNITY — FIRST MOVER**+฿8–12 billion**

EBITDA uplift (~10–14% of ฿85B EBITDA) if SIG moves early: renewable energy sales (solar farms selling into the Thai and SE Asian demand market), low-carbon product lines, avoided Scope 2 carbon cost, and access to green finance at lower cost of capital.

Honest framing: the green opportunity offsets roughly 16–24% of the peak ฿50B carbon exposure — it improves resilience and signals strategy to investors, but it does not by itself rescue the long-term carbon position. Mitigation and opportunity must progress together.

What the ฿8–12B actually is — and what it costs.

The ฿8–12B is an EBITDA uplift earned on invested capital, not free upside. The most material component is renewable generation: SIG develops utility-scale solar (on its own land and rooftops, and in joint venture with an energy developer), then sells the power under long-term contract. Industry practice offers two routes. Build-and-hold: SIG funds and owns the asset, capturing the full long-term margin but tying up capital for the life of the plant. Develop-and-sell-down: SIG co-develops with a partner, sells down a majority equity stake once the asset is operating and de-risked, and recycles the capital into the next project — lower margin per asset, but faster capital turnover and shared construction risk. The revenue is secured by a power purchase agreement (PPA): a 10–25 year contract under which an offtaker — a utility, the grid, or a corporate buyer shifting to renewables — buys the output at a pre-set price. That contracted cash flow is what makes the project financeable with project debt rather than SIG's balance sheet.

With Southeast Asia's electricity demand projected to rise about 70% by 2035 under the IEA's Announced Pledges Scenario, capturing the region's structural supply gap — where renewable capacity must scale three- to fivefold from its 2024 baseline of roughly 120 GW (IEA, 2026) — positions SIG for the ฿8–12 billion EBITDA uplift via utility-scale solar. Backed by contracted 10–25 year PPAs, this regional revenue offsets 16–24% of SIG's peak carbon exposure while defending its 18x P/E multiple against a ฿90–180 billion equity de-rate. It turns a regional demand tailwind into a strategic hedge for SIG's hard-to-abate asset base. The Committee must now decide whether to deploy a build-and-hold or a capital-recycling sell-down model alongside the required ฿4 billion physical adaptation program.

What the board should require management to answer.

- How much capital does the ฿8–12B require, over what horizon, and what return on invested capital does it earn against SIG's cost of capital?
- Build-and-hold or develop-and-sell-down — and why? The choice trades long-term margin against capital turnover and construction-risk exposure.
- Is the revenue contracted under long-term PPAs or exposed to merchant grid prices? Who are the offtakers, and is their credit strong enough to make the projects financeable?
- Does this compete with the ฿4B adaptation program for the same capital, or can both be funded? This is the core allocation question — protective capital and generative capital weighed together.
- Do these capital allocations align with our agreed strategy — or is the strategy itself what needs to change?
- Where do these decisions sit within our risk appetite — and do we have a set risk appetite policy to judge them against?

Two kinds of capital, two tests.

The ฿8–12B green opportunity is generative capital — it must clear SIG's weighted average cost of capital (WACC), the hurdle below which a deployment destroys value. The ฿4B adaptation is protective capital — judged on value protected per baht (฿2.46), an insurance test, not a return test. Clearing either financial test is necessary, never sufficient: the board still approves or declines against strategy and the residual climate risk it will accept. Quantified risk moves both — lifting the risk premium inside WACC, and setting the appetite that governs how much capital is committed.

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9 WHAT THE BOARD IS BEING ASKED TO DECIDE

Management has presented its analysis. The committee is now asked to review, challenge, and form a position on the following:

1. Endorse management's scenario selection and moderated carbon price assumptions as a reasonable and defensible basis for SIG's climate scenario analysis.
2. Accept the resilience assessment finding that SIG's business model is viable through the medium term but requires committed abatement and adaptation investment now to preserve long-term viability.
3. Approve the ฿4 billion group adaptation program in principle, and the ฿500 million Phase 1 Bangkok flood-defense tranche for immediate execution. Separately, decide whether to proceed now with the ฿8–12 billion green opportunity, or hold it for a later board session.
4. Direct management on the IFRS S1 connected-information disclosure (paragraphs 21–24, B42(c)) of the clinker kiln stranding inconsistency, and on the pace of CCS and clinker-substitution feasibility work.
5. Decide how the ฿4 billion is financed, not only whether it is approved. SIG carries ฿300B of existing debt. Direct management to bring a source-of-funds plan: existing debt headroom and covenant impact, a sustainability-linked loan or green bond (where adaptation and low-carbon capital expenditure can lower the cost of capital), internal cash, or a phased mix. The use of funds and the source of funds are one decision, not two.

Sources: IFRS S2 (ISSB 2023) | NGFS Phase 4 (2024) | IPCC AR6 | Thailand Draft Climate Change Act (2024, Ch.8 ETS, Ch.10 carbon tax) | Entelligent SAFE 2025 | Weather Trade Net | TEAMG GHG Platform | WBCSD/CSI Cement CO₂ Protocol