FACTORLY PRELIMINARY INDUSTRIAL ENERGY INTELLIGENCE & SOLAR FEASIBILITY REPORT

Prepared for: [Name] [Name], Head of Building Management Contact: [email] Account Reference: Northstar Building — [email] Report Type: Preliminary Desktop Energy Intelligence & Solar Feasibility Assessment Assessment Date: May 2026 Prepared by: Factorly AI Preliminary Assessment Engine

Northstar Building is a multi-storey mixed-use industrial and commercial facility located in the established Ang Mo Kio industrial corridor in Singapore. Based on the submitted photograph, the building presents as a modern mid-rise structure of approximately 7–8 storeys with glazed curtain-wall facades, perimeter balconies and visible rooftop plant and signage. The facility operates under company ownership with the Owner/Managing Director as the primary energy and solar decision-maker.

The facility hosts manufacturing operations alongside commercial-use tenants or departments, operating across two production shifts, five days per week. The submitted utility bill data indicates a monthly electricity consumption of approximately 220,000 kWh and a total monthly electricity bill of approximately S$65,384–S$72,584 (inclusive of water and refuse charges). This positions Northstar Building firmly within the medium-to-large commercial and industrial energy consumer segment in Singapore.

The primary objective of this Factorly assessment is to evaluate the facility's suitability for rooftop solar installation, AI-driven energy monitoring, predictive maintenance, ESG carbon reporting and a combined energy cost-reduction strategy.

Item	Summary
Factory / Building Name	Northstar Building
Address	7030 Ang Mo Kio Ave 5, Singapore 569880
Factory Type	Mixed-use industrial facility (Manufacturing + Commercial)
Building Form	Multi-storey mid-rise, approximately 7–8 storeys (based on site image)
Ownership Status	Owned by company — installation approvals available
Industry Activity	Manufacturing (primary); mixed commercial use
Land Size (Estimated)	50,000–99,999 sq ft
Built-Up Area (Estimated)	100,000–249,999 sq ft (utility bill reference: ~200,000 sq ft)
Usable Roof Area (Declared)	10,000–29,999 sq ft — concrete slab, good condition
Location	Ang Mo Kio Ave 5, Singapore — equatorial high-irradiance zone
Operating Days	5 days/week (declared); utility bill reference: 6 days/week
Operating Hours per Day	8–12 hours/day (declared); utility bill reference: 10–12 hours/day
Production Shifts	2 shifts
Daytime Production Intensity	High
Number of Employees	50–199 on site
Monthly Electricity Consumption	~220,000 kWh/month (utility bill reference)
Monthly Electricity Bill	S$65,384 (electricity only) / S$72,584 (total utilities)
Electricity Tariff	S$0.2972/kWh (commercial tariff — utility bill reference)
Peak Demand Level	500–999 kW (declared)
Tariff Type	Commercial Tariff / Medium Voltage
Main Energy Consumers	HVAC/Chillers, production machines, lifts, lighting, office IT, common areas

Item	Summary
Solar Currently Installed	No
Energy Monitoring System	None currently
IoT / SCADA / BMS	None currently
Primary Objective	Reduce electricity costs, plan solar investment, improve efficiency, reduce carbon footprint
Preferred Engagement Model	Pilot project
Decision Timeline	Immediate
Data Confidence — Overall	Medium (utility bill data provided; no interval metering, no equipment list reviewed, no roof structural data)

Data Source	Confidence	Notes
Utility bill (monthly consumption & cost)	Medium–High	Single hypothetical bill period provided; 12-month trend not available
Roof area and condition	Medium	Self-declared; structural and shading assessment not yet conducted
Peak demand	Medium	Self-declared range; no interval demand data or meter download available
Equipment list	Low–Medium	Declared as available but not yet reviewed by Factorly
Operating hours	Medium	Slight discrepancy between declared (5 days) and utility bill reference (6 days) — to be clarified
Building image	Informational	Confirms multi-storey mid-rise form; rooftop not visible from submitted angle
ESG / carbon baseline	Low	No existing ESG targets or baseline data provided

Based on the submitted data, utility bill evidence and facility imagery, Northstar Building presents as a commercially attractive and technically feasible candidate for a combined solar, AI energy monitoring and ESG reporting solution. The key findings at this preliminary stage are summarised below.

Solar Feasibility: The rooftop area declared (10,000–29,999 sq ft of concrete slab in good condition) is sufficient to support a preliminary estimated system size of 200–500 kWp. Singapore's equatorial irradiance (~1,580–1,650 kWh/kWp/year) supports strong generation yields. With a monthly consumption of approximately 220,000 kWh, solar self-consumption penetration is estimated at 10–25% of total electricity demand, depending on final roof area confirmed, shading, structural loading capacity and grid export limitations. This represents a meaningful but partial offset of electricity costs.

Energy Optimisation: At S$65,384/month in electricity costs and 220,000 kWh/month consumption, the facility has significant headroom for energy savings. The absence of any current energy monitoring system means that wastage patterns, peak demand spikes and equipment inefficiencies are currently invisible to the management team. AI monitoring alone is estimated to unlock 5–15% savings through operational behaviour changes and demand management.

Predictive Maintenance: The facility reports production machines and chillers as major energy consumers, with occasional machine breakdowns and high maintenance costs identified as operational pain points. The absence of IoT or BMS infrastructure means predictive maintenance is currently not possible. Implementation of AI monitoring with vibration, temperature or power-draw sensors on critical assets (chillers, compressors, production machinery) could reduce unplanned downtime and maintenance costs materially.

ESG Reporting: No formal ESG targets or carbon baseline currently exist. However, board requirements and interest in carbon reduction reports, green financing and solar generation reporting indicate that ESG capability will be important for Northstar Building. Factorly can support the establishment of a Scope 2 electricity carbon baseline, solar generation reporting and a green financing narrative aligned with Singapore's Green Plan 2030 and relevant green building frameworks.

Commercial Attractiveness: The combination of a large monthly electricity bill, company-owned building with installation authority, immediate decision timeline and genuine interest in a pilot project makes this facility a high-priority commercial opportunity for an energy company or solar/AI solution provider. The preferred engagement model (pilot project) and stated desire for a cost reduction roadmap support a structured phased commercial proposal.

Assessment Area	Preliminary Conclusion	Confidence
Solar Feasibility	Feasible — estimated 200–500 kWp rooftop system possible on concrete slab roof; subject to structural and shading review	Medium
Energy Optimisation	Strong opportunity — 220,000 kWh/month with no monitoring; AI monitoring estimated to unlock 5–15% savings	Medium–High
Predictive Maintenance	Good opportunity — chillers and production machines are high-value monitoring targets; no existing IoT infrastructure requires new sensor deployment	Medium
ESG Reporting	Emerging need — board-driven requirement; no existing baseline; Factorly can support Scope 2 baseline, solar generation and green financing narrative	Medium
Commercial Attractiveness	High — company-owned, immediate timeline, S$65K+/month electricity bill, pilot project preference, full decision-maker access	High

Metric	Preliminary Estimate	Basis
Monthly electricity consumption	~220,000 kWh	Utility bill submitted
Monthly electricity cost	~S$65,384	Utility bill submitted
Estimated annual electricity spend	~S$785,000	Bill × 12 months
Estimated solar system size range	200–500 kWp	Based on 10,000–29,999 sq ft roof area
Estimated annual solar generation	316,000–795,000 kWh/year	At 1,580–1,590 kWh/kWp/year (Singapore)
Estimated solar self-consumption offset	10–25% of monthly demand	Subject to daytime load profile confirmation
Estimated annual electricity cost saving (solar only)	S$30,000–S$80,000/year	At S$0.2972/kWh tariff, conservative self-consumption
Estimated AI monitoring savings potential	5–15% of electricity cost	Industry benchmark for unmonitored industrial facilities
Estimated combined annual savings potential	S$70,000–S$170,000/year	Solar + AI monitoring combined, preliminary range
Indicative simple payback (solar, no storage)	5–9 years	Subject to system cost, financing and incentive confirmation

End of Section 1 and Section 2 — Factorly Preliminary Assessment Sections 3–10 available upon request.

Northstar Building presents one of the most commercially straightforward ownership and approval profiles that a solar or AI energy solution provider will encounter in Singapore's industrial sector. The facility is company-owned, the decision-maker is the Owner/Managing Director, and the contact person — [Name] , Head of Building Management — has confirmed that the company can approve solar and AI monitoring installations directly. There are no landlord constraints, no HQ overseas approval chains and no tenancy barriers identified at this stage.

This is a significant commercial advantage. In many Singapore industrial assessments, the primary obstacle to project progress is the absence of landlord consent or the complexity of multi-tenanted strata ownership. Neither applies here. The building's company-owned status means that roof access, electrical infrastructure modifications, metering upgrades and AI sensor deployment can all be approved internally without third-party landlord negotiation.

The Owner/Managing Director holds ultimate authority over capital expenditure and strategic energy decisions. [Name] , as Head of Building Management, is the operational point of contact and is likely

the key internal champion for day-to-day project coordination, site access and facilities management alignment. This two-tier structure — strategic sponsor at MD level, operational lead at building management level — is ideal for progressing from pilot project to full deployment efficiently.

One area to clarify at the next engagement stage is whether the facility has a Board of Directors or Finance Committee that requires presentation of capital proposals above a certain threshold. Given that a solar system of 200–500 kWp may represent a capital outlay of S$300,000–S$900,000 (indicative range, subject to system design and commercial model), board-level awareness and endorsement is prudent even where the MD holds authority.

The preferred commercial arrangement has been declared as "Not sure", which is common at this preliminary stage and presents an opportunity for the solution provider to guide the client toward the most appropriate structure. Three primary commercial models are relevant for Northstar Building's profile:

Commercial Model	Description	Suitability for Northstar
Direct Purchase / CAPEX	Company funds solar system outright; owns asset from day one; maximises long-term savings	Suitable if company has capital available and seeks maximum ROI
Solar Lease / Operating Lease	Fixed monthly lease payment for solar system use; no large upfront CAPEX; system owned by provider	Suitable if CAPEX preservation is a priority
Power Purchase Agreement (PPA)	Company pays for solar electricity at a contracted rate (typically below grid tariff); zero upfront cost; provider owns and maintains system	Strong fit given "not sure" on model and pilot project preference
Pilot Project + Phased Expansion	Start with AI monitoring or partial solar; expand based on demonstrated savings	Aligns directly with stated preference and immediate timeline

Given the pilot project preference, immediate decision timeline and the uncertainty on commercial model, a PPA or phased CAPEX approach beginning with AI monitoring deployment is likely to be the lowest-friction entry point. AI monitoring requires minimal capital commitment, delivers visible data within weeks, and builds the evidence base for a confident solar investment decision.

Northstar Building demonstrates high follow-up readiness across all key dimensions:

- Consent to be contacted confirmed
- Company-owned building — no landlord barrier

- Decision-maker identified and accessible
- Operational contact ([Name]) named and reachable
- Immediate decision timeline declared
- Equipment list declared as available
- Electricity bills and maintenance records available for sharing
- Pilot project engagement model preferred
- Commercial model preference not yet determined — requires guided proposal
- Board/Finance Committee approval threshold not yet confirmed
- ESG targets not yet formally established — may require internal alignment

Item	Assessment
Ownership / Tenancy	Company-owned — no landlord consent required; full ownership authority confirmed
Approval Authority	Owner / Managing Director holds primary approval authority; Board/Finance Committee threshold to be confirmed for capital proposals
Decision-Maker	Owner / Managing Director (strategic); [Name] , Head of Building Management (operati contact and internal champion)
Preferred Commercial Model	Not yet determined — PPA or phased pilot project recommended as lowest-friction entry point; direct purchase viable if capital available
Follow-Up Readiness	High — consent confirmed, immediate timeline, named contacts, data available for sharing; commercial model guidance needed

From the submitted exterior photograph, the following observations can be made with reasonable confidence:

Building Type: Northstar Building is a modern mid-rise structure, estimated at 7–8 storeys above ground level based on visible floor bands in the image. The building presents a relatively regular rectangular footprint — typical of Singapore's B1/B2 industrial-commercial cluster developments along Ang Mo Kio Avenue 5.

Façade Condition: The building appears in good to very good condition, with clean glazed curtain-wall panels, white-painted concrete or composite cladding, and no visible signs of significant weathering, spalling or structural deterioration. This is consistent with the self-declared roof condition of "Good."

Rooftop Visibility: The rooftop is not directly visible in the submitted image. However, the presence of a prominent Northstar signage structure on the apparent roofline, visible rooftop plant or HVAC equipment silhouettes, and what appear to be balcony or setback terrace areas on upper floors are observable. Red canopy/umbrella structures visible on an upper-floor terrace suggest accessible outdoor areas, which may indicate that part of the upper building is used as a communal or amenity space — potentially reducing net usable solar roof area.

Concrete Slab Roof (Declared): The self-declared roof type of concrete slab is consistent with the building's apparent construction era and typology. Concrete slab roofs in Singapore are generally well-suited to solar mounting systems using ballasted or anchor-fixed racking, subject to structural loading capacity confirmation.

Based on building form inference and declared data:

Roof / Infrastructure Factor	Preliminary Observation
Signage structure	Large "Northstar" illuminated signage visible at roofline — likely steel-framed, occupying a portion of the rooftop parapet zone; may restrict panel layout in that quadrant
HVAC / Rooftop plant	Typical for a building of this type and size — chillers, cooling towers and AHU plant are likely present; extent not confirmed from image
Terrace / amenity areas	Upper-floor terrace with shade structures visible — if rooftop terrace exists, this area may be inaccessible or structurally limited for solar mounting
Balcony projections	Perimeter balconies visible on multiple floors — these overhang the façade and are unlikely to affect rooftop solar directly but confirm a setback perimeter design
Parapet height	Parapet walls visible — likely to provide some shading on panel rows nearest to edges; parapet shading analysis required
Lift overrun / plant rooms	Likely present but not visible from submitted angle — standard for mid-rise buildings; will reduce usable area

Singapore's equatorial location means that solar elevation is high throughout the year (typically 48–90° at solar noon), which significantly reduces the impact of distant shading objects compared to higher-latitude locations. Key shading considerations for Northstar Building include:

- Internal obstructions (signage, HVAC plant, lift overruns): Moderate risk — likely to reduce usable roof area by 15–30%

- Inter-row shading (panel-to-panel): Low-to-moderate risk given Singapore's high solar elevation; manageable with appropriate row spacing
- Adjacent building shading: From the image, Northstar Building appears to be one of the taller structures in its immediate vicinity — external shading risk appears low
- Parapet wall shading: Low-to-moderate; panels set back from parapet edge will have minimal shading impact

Overall preliminary shading risk is assessed as Low to Moderate, which is favourable for solar generation performance.

Infrastructure Factor	Preliminary Assessment
Main switchroom / MSB location	Typical for a building of this type — likely located at ground or basement level; cable routing from rooftop to MSB will require conduit pathway planning and costing
Cable routing distance	Estimated 25–50 metres vertical plus horizontal routing for a 7–8 storey building — moderate cable cost; to be confirmed on site
Metering arrangement	Commercial tariff / medium voltage — likely SP Group or contestable retailer metering; smart meter or sub-metering upgrade may be required for solar generation monitoring
Grid connection	No existing solar; new grid notification / SP PowerAssets solar application required; capacity subject to SP Group approval
Structural loading	Concrete slab roof declared — ballasted or anchor-fixed racking feasible; structural engineer to confirm slab load capacity before system design

Roof / Site Factor	Preliminary Finding	Risk Level
Roof type	Concrete slab (declared, consistent with building typology) — well-suited to solar mounting with ballasted or fixed racking	Low
Roof condition	Good condition (self-declared); exterior building condition appears consistent — no visible structural concerns from façade image	Low
Obstructions	Signage structure, HVAC/chiller plant, possible lift overruns and terrace areas likely present — estimated to reduce usable roof area by 15–30%	Medium
Shading	Internal obstruction shading moderate; external/adjacent building shading low; Singapore high solar elevation reduces inter-row shading risk	Low–Medium
Parapet and setbacks	Standard parapet walls visible; setback requirements will further reduce panel-deployable area near roof edges	Low–Medium
Cable routing	Vertical cable run of ~25–50 m estimated for 7–8 storey building; requires conduit pathway planning and MSB capacity check	Medium
Structural review need	Required — concrete slab load capacity for panel and racking weight must be confirmed by structural engineer before system design	High (action required)
Drone / roof survey need	Strongly recommended — rooftop not visible from submitted image; drone survey or roof-level site visit required to confirm usable area, obstructions and layout feasibility	High (action required)

The following solar capacity estimates are derived from the declared usable roof area (10,000–29,999 sq ft), adjusted for realistic obstruction and setback deductions, and modelled against

Singapore-specific solar irradiance benchmarks. All assumptions are stated explicitly and must be validated through physical survey and detailed engineering design.

Key Technical Assumptions:

Parameter	Assumption	Basis
Panel wattage	620 Wp (latest commercial bifacial monocrystalline module)	Current market standard for industrial rooftop projects
Panel physical size	Approximately 2.28 m × 1.13 m (~27.7 sq ft / ~2.58 m² per panel)	Standard 620W large-format module
Practical area allowance per panel	30–35 sq ft (including row spacing, maintenance access, cable management)	Singapore industrial rooftop convention
Singapore solar irradiance	1,580–1,650 kWh/kWp/year (annual yield benchmark)	EMA Singapore, SolarGIS data
System performance ratio	78–82%	Accounts for inverter losses, temperature derating, soiling, cable losses, availability
Effective usable roof area	50–70% of declared gross roof area	Accounts for obstructions, signage, HVAC plant, setbacks, parapet clearance, access paths
Orientation / tilt	Near-flat concrete slab; assumed 5–10° tilt with northward or optimal orientation	Singapore's near-equatorial position allows flexible orientation
Grid export limitation	Assumed some self-consumption constraint applies; full export may require SP PowerAssets approval	Singapore solar grid rules; to be confirmed

The declared gross usable roof area is 10,000–29,999 sq ft. Applying an effective area deduction of 30–50% for obstructions, setbacks, HVAC plant, signage and access pathways:

Scenario	Gross Declared Roof Area	Effective Area Deduction	Net Usable Area for Panels
Conservative	10,000 sq ft	50%	5,000 sq ft
Base Case	20,000 sq ft	40%	12,000 sq ft
Stretch	29,999 sq ft	30%	21,000 sq ft

Using a practical area allowance of 32 sq ft per panel (mid-range of 30–35 sq ft):

Scenario	Net Usable Area	Panel Count (@ 32 sq ft/panel)	System Size (@ 620 Wp/panel)	Confidence
Conservative	~5,000 sq ft	~156 panels	~97 kWp	Low–Medium
Base Case	~12,000 sq ft	~375 panels	~233 kWp	Medium
Stretch	~21,000 sq ft	~656 panels	~406 kWp	Low–Medium

Applying Singapore's annual yield benchmark of 1,580–1,650 kWh/kWp/year and a system performance ratio of 78–82%:

Scenario	System Size	Annual Generation (Low)	Annual Generation (High)	Estimated Range
Conservative	~97 kWp	153,000 kWh	160,000 kWh	~153,000–160,000 kWh/year
Base Case	~233 kWp	368,000 kWh	384,000 kWh	~368,000–384,000 kWh/year
Stretch	~406 kWp	641,000 kWh	669,000 kWh	~641,000–669,000 kWh/year

Based on declared monthly consumption of 220,000 kWh/month (~2,640,000 kWh/year), with daytime self-consumption assumed at 60–75% of total generation (given 2-shift daytime operations):

Scenario	Annual Generation	Estimated Self-Consumed (60–75%)	Annual Offset vs Total Consumption	Monthly Equivalent Offset
Conservative	~156,500 kWh	~94,000–117,000 kWh	3.6–4.4%	~7,800–9,800 kWh/month
Base Case	~376,000 kWh	~226,000–282,000 kWh	8.6–10.7%	~18,800–23,500 kWh/month
Stretch	~655,000 kWh	~393,000–491,000 kWh	14.9–18.6%	~32,750–40,900 kWh/month

At the declared electricity tariff of S$0.2972/kWh:

Scenario	Self-Consumed kWh/year	Estimated Annual Saving	Monthly Saving Equivalent
Conservative	~94,000–117,000 kWh	S$27,900–S$34,800/year	~S$2,325–S$2,900/month
Base Case	~226,000–282,000 kWh	S$67,200–S$83,800/year	~S$5,600–S$6,980/month
Stretch	~393,000–491,000 kWh	S$116,800–S$145,900/year	~S$9,730–S$12,160/month

Scenario	Usable Roof Area	Panel Count	System Size	Est. Annual Generation	Solar Offset (% of consumption)	Est. Annual Saving	Confidence
Conservative	~5,000 sq ft	~156 panels	~97 kWp	~153,000–160,000 kWh	~3.6–4.4%	~S$28,000–S$35,000	Low–Medium
Base Case	~12,000 sq ft	~375 panels	~233 kWp	~368,000–384,000 kWh	~8.6–10.7%	~S$67,000–S$84,000	Medium
Stretch	~21,000 sq ft	~656 panels	~406 kWp	~641,000–669,000 kWh	~14.9–18.6%	~S$117,000–S$146,000	Low–Medium

End of Sections 3, 4 and 5 — Factorly Preliminary Assessment Sections 6–10 available upon request.

Section 5 established three system size scenarios — Conservative (~97 kWp), Base Case (~233 kWp) and Stretch (~406 kWp) — based on declared roof area deductions and obstruction estimates. Section 6 now applies Singapore-specific solar irradiance data and performance adjustment factors to translate installed capacity into realistic generation estimates.

Solar Generation Assumptions:

Parameter	Value Applied	Basis
Singapore annual irradiance	1,580–1,650 kWh/kWp/year	EMA Singapore, SolarGIS, SERIS benchmarks
Peak sun hours (daily average)	4.33–4.52 hours/day	Equatorial Singapore; consistent year-round
System Performance Ratio (PR)	78–82%	Accounts for all system losses (see below)
Panel technology	620 Wp bifacial monocrystalline	Current commercial standard
Inverter efficiency	97–98%	String or central inverter assumption
Temperature derating	–3 to –5%	Singapore ambient 28–35°C; modules operate at 45–65°C
Soiling / dust losses	–2 to –3%	Urban Singapore; quarterly cleaning assumed
Cable and connection losses	–1 to –2%	Standard allowance
Shading losses	–3 to –6%	Based on obstruction risk assessment in Section 4
System availability	98–99%	Grid-tied system; minimal downtime assumed
Degradation (Year 1 baseline)	0% applied	Year 1 generation estimate; long-term degradation ~0.5%/year

Effective Annual Yield Applied: - Conservative scenario: 1,580 kWh/kWp/year × 78% PR = 1,232 kWh/kWp effective yield - Base Case: 1,615 kWh/kWp/year × 80% PR = 1,292 kWh/kWp effective yield - Stretch: 1,650 kWh/kWp/year × 82% PR = 1,353 kWh/kWp effective yield

Singapore's solar generation is relatively stable year-round due to its equatorial location, with minor seasonal variation driven by monsoon cloud cover. Generation is typically slightly lower during the Northeast Monsoon (November–January) and inter-monsoon periods (April, October) due to increased cloud cover and rainfall. The table below applies an indicative monthly distribution based on Singapore's typical irradiance seasonality.

Indicative Monthly Generation Distribution (Base Case ~233 kWp, ~301,000 kWh/year):

Month	Relative Irradiance	Est. Monthly Generation (Base Case)
January	Lower (NE Monsoon)	~22,500 kWh
February	Moderate	~24,500 kWh
March	Good	~26,000 kWh
April	Moderate (inter-monsoon)	~24,000 kWh
May	Good	~26,500 kWh
June	Good (SW Monsoon — drier)	~27,500 kWh
July	Good	~27,000 kWh
August	Good	~26,500 kWh
September	Moderate	~25,000 kWh
October	Moderate (inter-monsoon)	~23,500 kWh
November	Lower (NE Monsoon onset)	~22,500 kWh
December	Lower (NE Monsoon)	~21,500 kWh
Full Year Total	-	~301,000 kWh/year

Northstar Building operates 2 production shifts, 5 days/week, 8–12 hours/day with high daytime production intensity. This is a favourable self-consumption profile, as peak solar generation hours (approximately 08:00–17:00) align closely with the facility's primary operating hours.

Consumption Alignment Factor	Assessment
Daytime production intensity	High — strong solar self-consumption potential during generation hours
Weekend generation vs. consumption	Generation continues 7 days; facility operates 5 days — weekend surplus likely
Night shift consumption	Solar does not contribute to night shift load — battery storage would be required
Holiday / shutdown periods	Solar generation continues during factory holidays — surplus or curtailment risk

Self-Consumption Rate Assumption: 60–75% of total annual generation is assumed to be directly consumed on-site during operating hours. The remaining 25–40% may be exported to the grid (subject to SP PowerAssets approval and retailer arrangement) or curtailed.

Scenario	System Size	Annual Generation	Monthly Avg Generation	Est. Self-Consumed/Year	Est. Exported/Year	Consumption Offset (Self-Consumed vs 2,640,000 kWh/year)
Conservative	~97 kWp	~119,500 kWh	~9,960 kWh	~71,700–89,600 kWh	~29,900–47,800 kWh	2.7–3.4%
Base Case	~233 kWp	~301,000 kWh	~25,100 kWh	~180,600–225,800 kWh	~75,300–120,400 kWh	6.8–8.6%
Stretch	~406 kWp	~549,600 kWh	~45,800 kWh	~329,800–412,200 kWh	~137,400–219,800 kWh	12.5–15.6%

Scenario	Self-Consumed kWh/year	Grid Tariff Saving (@S$0.2972/kWh)	Estimated Export Revenue (if applicable)	Total Estimated Annual Value
Conservative	~71,700–89,600 kWh	S$21,300–S$26,600	S$3,600–S$5,700 (indicative)	~S$24,900–S$32,300/year
Base Case	~180,600–225,800 kWh	S$53,700–S$67,100	S$9,000–S$14,400 (indicative)	~S$62,700–S$81,500/year
Stretch	~329,800–412,200 kWh	S$98,000–S$122,400	S$16,500–S$26,300 (indicative)	~S$114,500–S$148,700/year

Scenario	Annual Generation	Monthly Generation	Consumption Offset	Confidence
Conservative	~119,500 kWh	~9,960 kWh	~2.7–3.4%	Low–Medium
Base Case	~301,000 kWh	~25,100 kWh	~6.8–8.6%	Medium
Stretch	~549,600 kWh	~45,800 kWh	~12.5–15.6%	Low–Medium

A utility bill document was submitted by Northstar Building for the billing period 27 March 2026 – 27 April 2026. The document was presented as a hypothetical/illustrative bill summary. Factorly has extracted all available data fields from the submitted document. Fields not visible or not present in the submitted document are marked accordingly.

Bill Field	Extracted Value	Source / Status
Billing Period	27 March 2026 – 27 April 2026 (31 days)	Extracted from submitted bill
Bill Date	28 April 2026	Extracted from submitted bill
Account Type	Commercial / Industrial	Extracted from submitted bill
Electricity Retailer / Utility Provider	Not visible — SP Group or contestable retailer	Not stated in submitted document
Account Number	Not visible	Not provided
Electricity Usage	220,000 kWh	Extracted from submitted bill
Electricity Charges	S$65,384	Extracted from submitted bill
Electricity Tariff Rate	S$0.2972/kWh	Extracted from submitted bill
Water Usage	1,800 m^3	Extracted from submitted bill
Water Charges	S$5,200	Extracted from submitted bill
Refuse / Waste Removal	S$2,000	Extracted from submitted bill
GST / Taxes	Included in total	Stated as included
Total Amount Payable	S$72,584	Extracted from submitted bill
Peak / Maximum Demand (kW or kVA)	Not visible — declared range 500–999 kW	Stated in intake form; not on bill
Demand Charges	Not visible	Not itemised in submitted document
Power Factor Penalty	Not visible	Not itemised in submitted document
Fuel Cost Adjustment	Not visible	Not stated
Transmission / Grid Charges	Not visible	Not itemised in submitted document
Solar Export Credit	Not applicable — no solar installed	Confirmed in intake form
12-Month Consumption Trend	Not available — single bill period only	Only one bill period submitted

1. Electricity Unit Cost: The effective electricity tariff of S$0.2972/kWh is consistent with Singapore's commercial and medium-voltage industrial tariff range for 2025–2026. This is above the general low-tension residential tariff but within the expected range for a large commercial/industrial account. If

the facility is on a contestable retailer plan, there may be opportunity to renegotiate tariff terms — particularly if solar and storage are added to the load profile.

2. Consumption Intensity: At 220,000 kWh over 31 days, the daily average consumption is approximately 7,097 kWh/day. For a facility operating 10–12 hours/day, this implies an average operating power draw of approximately 590–710 kW during operating hours — broadly consistent with the declared peak demand range of 500–999 kW. This suggests the facility is operating at or near its peak demand level for significant portions of its operating day.

3. Single Bill Period Limitation: Only one billing period (one month) has been submitted. A 12-month utility bill history would be necessary to identify: - Seasonal consumption trends - Peak demand months (relevant for demand charge optimisation) - Anomalous high-consumption periods indicating equipment faults or energy wastage - Accurate annual electricity spend for financial modelling

4. Missing Demand Charge Breakdown: Medium-voltage commercial accounts in Singapore typically include a maximum demand charge component in addition to energy consumption charges. This is not separately itemised in the submitted bill. If a demand charge applies, peak demand management through AI monitoring or battery storage could deliver additional savings beyond unit rate reduction.

5. Power Factor: Power factor penalty data is not visible in the submitted bill. Industrial facilities with large motor loads (chillers, production machinery, compressors) commonly experience power factor below 0.9, triggering penalty charges under Singapore's tariff structure. This should be investigated during the site energy audit.

6. Water Consumption: At 1,800 m^3/month, water consumption is significant for a manufacturing facility. While outside the core solar/AI energy scope, this data point may indicate cooling tower or process water usage linked to chiller plant — relevant for energy monitoring and ESG water reporting.

Given that only a single bill period is available, Factorly has constructed three consumption scenarios to represent plausible operating ranges across a full year, based on the submitted bill data, declared operating pattern and typical manufacturing facility consumption variability.

Scenario	Monthly kWh	Monthly Electricity Cost	Annual Electricity Cost (Projected)	Key Load Drivers
Conservative (low-intensity months)	~170,000 kWh	~S$50,500	~S$606,000	Lighting, office IT, common areas, reduced production load
Base Case (typical operating month)	~220,000 kWh	~S$65,400	~S$784,800	Chillers, production machines, HVAC, lifts, lighting, common areas
High Use (peak production months)	~270,000 kWh	~S$80,200	~S$962,400	Full chiller load, multi-shift production, extended hours, high ambient temperature

Based on the building type (multi-storey mixed industrial/commercial), declared equipment (production machines and chillers) and Singapore industrial energy benchmarks, the following preliminary load breakdown is estimated:

Load Category	Estimated % of Total Consumption	Estimated Monthly kWh (Base Case)	Priority for Monitoring
Chillers / HVAC	35–45%	~77,000–99,000 kWh	■ High
Production Machinery	25–35%	~55,000–77,000 kWh	■ High
Lifts and vertical transport	5–8%	~11,000–17,600 kWh	■ Medium
Lighting (common areas + production)	5–8%	~11,000–17,600 kWh	■ Medium
Office IT and equipment	5–7%	~11,000–15,400 kWh	■ Low
Other / unaccounted (idle loads, small plant)	5–10%	~11,000–22,000 kWh	■ Medium

Issue	Preliminary Observation	Recommended Action
Demand charge visibility	Not itemised in submitted bill — unknown whether demand charges apply	Request full tariff schedule from retailer; confirm maximum demand charge component
Power factor	Not visible — large motor loads (chillers, production machines) may cause power factor issues	Conduct power factor measurement on-site; consider capacitor bank or active power factor correction
Tariff renegotiation	At ~220,000 kWh/month, facility qualifies as a large commercial account with bargaining leverage	Consider contestable market review; solar addition will strengthen negotiating position
Time-of-use (ToU) tariff	Not confirmed — if ToU tariff applies, peak hour consumption management could yield additional savings	Confirm tariff structure with retailer; AI monitoring can support ToU demand shifting
12-month trend	Only one bill available — no trend analysis possible	Submit 12 months of bills for comprehensive Factorly analysis

Northstar Building currently operates with no energy monitoring system, no IoT sensors, no SCADA and no BMS. This means that approximately S$785,000 per year in electricity expenditure is being managed with zero real-time visibility into where, when and how electricity is being consumed. This is one of the most significant energy intelligence gaps that Factorly consistently identifies in Singapore's mixed industrial building segment.

The absence of monitoring infrastructure is not merely an inefficiency — it is a commercial risk. Without visibility, machine degradation, chiller inefficiency, idle-load waste, power factor deterioration and abnormal consumption patterns go undetected until they manifest as either a large electricity bill increase, a machine breakdown or a costly maintenance event. At Northstar Building's consumption and cost level, even a 5% improvement in energy efficiency would deliver approximately S$39,000–S$48,000/year in recurring savings — before any solar generation benefit is applied.

The facility has confirmed that electricity bills and maintenance records are available for sharing. This provides a baseline dataset from which Factorly's AI engine can begin identifying consumption anomalies, benchmarking performance and building predictive models as monitoring infrastructure is progressively deployed.

1. Chillers and HVAC

Chillers are estimated to represent 35–45% of total electricity consumption at Northstar Building — the single largest load category. For a multi-storey building of this size operating in Singapore's tropical climate, chiller plant performance is the highest-value target for both energy optimisation and

predictive maintenance.

Key AI Monitoring Opportunities: - Chiller coefficient of performance (COP) trending: Detect gradual COP decline caused by refrigerant leaks, condenser fouling, compressor wear or poor controls tuning before it causes significant energy waste - Chilled water supply/return temperature monitoring: Identify Δ T collapse (low temperature differential) indicating coil fouling, pump issues or control inefficiency - Cooling tower fan and pump efficiency: Monitor motor current draw and flow rates to detect fouling, belt slippage or impeller wear - Setpoint optimisation: AI analysis of ambient temperature vs. chiller setpoint can identify opportunities to raise chilled water setpoints during mild weather, reducing compressor energy by 2–4% per °C of setpoint relaxation - Chiller sequencing optimisation: For multi-chiller plants, AI can recommend optimal chiller staging based on actual load demand, avoiding part-load inefficiency

Indicative Savings Potential: 8–15% reduction in chiller energy consumption through monitoring and optimisation

2. Production Machinery

Production machines are estimated to represent 25–35% of total consumption. With machine breakdowns identified as an operational pain point and high maintenance costs flagged, this is both an energy optimisation and predictive maintenance priority.

Key AI Monitoring Opportunities: - Motor current signature analysis (MCSA): Non-invasive monitoring of motor current draw patterns to detect bearing wear, rotor imbalance, coupling misalignment and winding degradation before failure - Anomalous consumption detection: AI baseline models identify when a specific machine consumes more power than expected for a given production run — indicating mechanical inefficiency, tooling wear or process deviation - Idle-running detection: Identify machines left running between production runs, during shift changeovers or during breaks — a common source of avoidable energy waste in multi-shift operations - Vibration and temperature monitoring: Clip-on vibration sensors and thermal sensors on critical rotating equipment provide early warning of mechanical degradation up to weeks before failure - Production efficiency correlation: Cross-reference energy consumption data with production output to calculate energy intensity per unit produced — a key metric for ESG and operational reporting

Indicative Savings Potential: 5–12% reduction in production machinery energy consumption; 20–40% reduction in unplanned maintenance costs through early fault detection

3. Lighting

Lighting is estimated to represent 5–8% of total consumption. For a multi-storey building with common areas, corridors, car parks, production floors and office zones, lighting represents a relatively straightforward upgrade opportunity with well-established ROI.

Key AI Monitoring Opportunities: - Daylight harvesting control: Occupancy and daylight sensors linked to AI control system to dim or switch off lighting in zones with adequate natural light — relevant for perimeter offices with glazed facades visible in building image - After-hours consumption detection: Identify lighting circuits that remain energised outside operating hours — common in large facilities without BMS - LED retrofit impact verification: Post-upgrade monitoring to confirm actual energy savings against predicted performance

Indicative Savings Potential: 30–60% reduction in lighting energy if legacy fluorescent or HID fittings are present; 5–15% improvement in LED system performance through smart controls

4. Lifts and Vertical Transport

For a 7–8 storey building, lift energy consumption (estimated 5–8% of total load) is a meaningful secondary target.

Key AI Monitoring Opportunities: - Lift motor efficiency monitoring: Detect deteriorating drive efficiency or regenerative braking underperformance - Traffic pattern optimisation: AI analysis of lift usage patterns to optimise car dispatching and reduce unnecessary trips - Standby power monitoring: Identify excessive standby consumption during low-traffic periods (nights, weekends)

5. Peak Demand Management

With a declared peak demand of 500–999 kW and a potential demand charge component in the tariff structure, peak demand management represents a significant but currently invisible cost opportunity.

Key AI Monitoring Opportunities: - Real-time demand monitoring with alert thresholds: AI system monitors instantaneous demand and alerts operators when approaching peak demand threshold — allows manual or automated load shedding before peak is set - Demand forecasting: AI models predict demand peaks based on production schedule, weather and historical patterns, enabling proactive demand management - Chiller staggered start: Prevent simultaneous chiller and production machine start-up at shift commencement — a common cause of demand spikes - Battery storage integration (future): Once baseline demand profile is established via monitoring, battery storage can be sized to shave demand peaks — particularly relevant if demand charges are confirmed in tariff

Indicative Savings Potential: 5–15% reduction in peak demand charge if demand charges are confirmed in tariff; requires 12-month interval metering data for accurate modelling

6. Idle-Load and After-Hours Consumption

In the absence of any BMS or monitoring system, after-hours and idle consumption at Northstar Building is currently unknown. Industry benchmarks suggest that 10–20% of total electricity in unmonitored industrial facilities is consumed outside core production hours through standby equipment, ventilation systems left running, lighting not switched off and HVAC systems not set back properly.

Key AI Monitoring Opportunities: - Baseline after-hours consumption profiling: Establish what the facility consumes at 02:00 on a non-production day — this becomes the "phantom load" benchmark - Phantom load reduction: AI system identifies circuits and equipment contributing to after-hours baseline and flags for operational review - Automated shutdown protocols: Integration with building management to automate non-critical load shutdowns at end of shift

Indicative Savings Potential: 3–8% of total annual consumption through idle-load reduction

7. Power Factor Correction

Power factor is not confirmed in the submitted bill but is a known risk for facilities with large inductive loads (chillers, motors, compressors). Poor power factor (below 0.85–0.90) can attract utility penalties and increase apparent power demand.

Key AI Monitoring Opportunities: - Continuous power factor measurement: Real-time monitoring of power factor across main incomer and sub-distribution boards - Penalty avoidance alerting: Automated alerts when power factor drops below threshold - Capacitor bank sizing recommendation: AI analysis of reactive power demand to size power factor correction equipment correctly

Opportunity	Potential Benefit	Required Data / Infrastructure	Priority
Whole-facility energy monitoring	Full visibility of consumption by zone, time and load type; establishes baseline for all other savings	Smart meters / sub-meters at MSB and key distribution boards; 15-minute interval data	■ Immediate
Chiller / HVAC optimisation	8–15% reduction in chiller energy (est. S$2 2,000–S$67,000/year); COP trending and fault early warning	Temperature sensors, flow meters, chiller BACnet/Modbus integration or clip-on current sensors	■ Immediate
Production machine monitoring	5–12% machine energy saving; early fault detection reducing breakdown frequency	Current transformers on machine MCCs; vibration and temperature sensors on critical rotating assets	■ High
Peak demand reduction	5–15% demand charge saving (quantum subject to tariff confirmation); prevents unexpected demand spikes	Interval metering; demand forecasting model; 12 months historical demand data	■ High
Idle-load / after-hours reduction	3–8% annual energy saving (est. S$24,000–S$63,000/year); identifies phantom loads	After-hours sub-metering; circuit-level monitoring on non-production loads	■ Medium
Predictive maintenance (rotating assets)	20–40% reduction in unplanned maintenance costs; reduced production downtime; extended asset life	Vibration sensors, thermal cameras or IoT clip-on sensors on chillers, motors, compressors	■ Medium
Lighting optimisation	30–60% lighting energy reduction if pre-LED; 5–15% via smart controls if LED installed	Circuit-level lighting sub-meters; occupancy and daylight sensors	■ Medium
Power factor correction	Penalty avoidance; potential 2–5% reduction in apparent demand charges	Power quality analyser on main incomer; continuous VAR monitoring	■ Medium

Opportunity	Potential Benefit	Required Data / Infrastructure	Priority
Downtime reduction (AI fault prediction)	Reduced lost production hours; lower emergency maintenance costs; improved OEE	Machine-level power monitoring + vibration/temperature; maintenance record integration	■ Short-term pipeline
ESG and carbon monitoring	Automated Scope 2 carbon tracking; solar generation reporting; green financing support data	Energy monitoring system as foundation; carbon intensity factors applied by Factorly AI	■ Short-term pipeline

Savings Category	Estimated Annual Saving Range	Confidence
Chiller / HVAC optimisation	S$22,000–S$67,000	Medium
Production machine efficiency	S$10,000–S$30,000	Low–Medium
Peak demand management	S$8,000–S$25,000	Low (tariff confirmation needed)
Idle-load / after-hours reduction	S$24,000–S$63,000	Medium
Lighting optimisation	S$5,000–S$15,000	Medium
Power factor correction	S$3,000–S$10,000	Low (penalty confirmation needed)
Total Estimated AI Monitoring Savings	S$72,000–S$210,000/year	Low–Medium

Phase	Scope	Timeline	Investment Level
Phase 1 — Pilot	Smart sub-meters at MSB and top 3 loads (chillers, production floor, HVAC); Factorly dashboard; 90-day baseline	Month 1–3	Low
Phase 2 — Expand	IoT sensors on critical rotating assets; interval demand monitoring; power factor measurement; AI anomaly detection	Month 4–9	Medium
Phase 3 — Optimise	Predictive maintenance models; solar integration monitoring; ESG carbon reporting; demand management automation	Month 10–18	Medium–High

End of Sections 6, 7 and 8 — Factorly Preliminary Assessment Sections 9–10 available upon request.

The commercial case for Northstar Building rests on four distinct but complementary value streams:

- Solar electricity savings — direct displacement of grid electricity with self-generated solar power
- AI energy optimisation savings — reduction in energy wastage, demand charges and operational inefficiency through monitoring and analytics
- ESG and carbon reporting value — avoided cost of carbon, green financing access, REC monetisation and regulatory compliance value
- Energy-company recurring revenue — the ongoing commercial opportunity for a solution provider delivering monitoring, analytics, maintenance alerts and advisory services

These four streams are modelled independently and then combined to produce a total estimated annual value range and indicative return on investment. All figures are preliminary desktop estimates. Refer to the disclaimer at the end of this section.

Based on Section 6 generation estimates and the confirmed electricity tariff of S$0.2972/kWh, with self-consumption assumed at 60–75% of annual generation:

Scenario	System Size	Annual Self-Consumed kWh	Grid Tariff Saving	Est. Export Revenue	Total Solar Annual Value
Conservative	~97 kWp	~71,700–89,600 kWh	S$21,300–S$26,600	S$3,600–S$5,700	S$24,900–S$32,300
Base Case	~233 kWp	~180,600–225,800 kWh	S$53,700–S$67,100	S$9,000–S$14,400	S$62,700–S$81,500
Stretch	~406 kWp	~329,800–412,200 kWh	S$98,000–S$122,400	S$16,500–S$26,300	S$114,500–S$148,700

Indicative Solar Capital Cost Range (supply, install, grid connection — no storage):

Scenario	System Size	Indicative CAPEX Range	Basis
Conservative	~97 kWp	S$120,000–S$175,000	S$1,200–S$1,800/kWp installed (Singapore market range)
Base Case	~233 kWp	S$280,000–S$420,000	S$1,200–S$1,800/kWp installed
Stretch	~406 kWp	S$490,000–S$730,000	S$1,200–S$1,800/kWp installed

Based on Section 8 analysis, AI monitoring and energy optimisation savings are estimated across key load categories. The absence of any current monitoring system means the savings opportunity is larger than it would be in a partially monitored facility.

Savings Category	Conservative	Base Case	Stretch
Chiller / HVAC optimisation	S$15,000	S$40,000	S$67,000
Production machine efficiency	S$8,000	S$19,000	S$30,000
Peak demand management	S$5,000	S$15,000	S$25,000
Idle-load / after-hours reduction	S$15,000	S$38,000	S$63,000
Lighting optimisation	S$4,000	S$10,000	S$15,000
Power factor correction	S$2,000	S$6,000	S$10,000
Total AI Optimisation Savings	S$49,000	S$128,000	S$210,000

AI Monitoring System CAPEX / Implementation Cost (Indicative):

Scope	Indicative Cost Range
Smart sub-metering (MSB + 5–8 sub-boards)	S$15,000–S$35,000
IoT sensors (chillers, motors, critical assets — 10–20 points)	S$20,000–S$50,000
Factorly AI platform setup and integration	S$10,000–S$25,000
Installation, commissioning and training	S$8,000–S$20,000
Total AI Monitoring Implementation (Pilot Phase)	S$53,000–S$130,000

AI Monitoring Recurring Annual Cost (Platform + Support):

Service Tier	Annual Cost Range
Factorly analytics platform licence	S$12,000–S$30,000/year
Remote monitoring and alert management	S$6,000–S$18,000/year
Quarterly advisory and reporting	S$6,000–S$15,000/year
Total Annual Recurring Cost	S$24,000–S$63,000/year

Northstar Building does not currently have formal ESG targets but has indicated board-level requirements for carbon reduction reporting, solar generation reporting and green financing support. ESG value is increasingly tangible in Singapore's industrial sector as green financing costs diverge from conventional financing and sustainability reporting requirements tighten.

Carbon Emissions Avoided (Solar Generation):

Singapore's grid emission factor is approximately 0.4168 kgCO_2/kWh (EMA 2024 grid emission factor). Applying this to solar generation self-consumed:

Scenario	Annual Self-Consumed kWh	CO■ Avoided (tonnes/year)
Conservative	~80,650 kWh avg	~33.6 tCO■/year
Base Case	~203,200 kWh avg	~84.7 tCO■/year
Stretch	~371,000 kWh avg	~154.7 tCO■/year

AI Optimisation Carbon Savings (from energy reduction):

Scenario	AI Energy Saving (kWh/year)	Additional CO■ Avoided
Conservative	~165,000 kWh	~68.8 tCO■/year
Base Case	~430,700 kWh	~179.5 tCO■/year
Stretch	~706,700 kWh	~294.6 tCO■/year

Total Combined Annual CO_2 Reduction:

Scenario	Total CO■ Avoided (tCO■/year)	Equivalent
Conservative	~102 tCO■	~22 passenger cars removed from road/year
Base Case	~264 tCO■	~57 passenger cars removed from road/year
Stretch	~449 tCO■	~97 passenger cars removed from road/year

Renewable Energy Certificate (REC) Value:

Solar generation may qualify for RECs under the International REC (I-REC) standard or Singapore's solar certificate frameworks. REC market pricing is variable.

Scenario	Annual Generation (kWh)	Est. RECs Generated	Indicative REC Value (@S$5–S$15/MWh)
Conservative	~119,500 kWh	~120 RECs	S$600–S$1,800/year
Base Case	~301,000 kWh	~301 RECs	S$1,505–S$4,515/year
Stretch	~549,600 kWh	~550 RECs	S$2,750–S$8,244/year

Green Financing Value:

A documented solar installation and AI-verified carbon reduction programme supports access to green financing instruments in Singapore, including: - MAS Green and Sustainable Financing frameworks - Enterprise Sustainability Programme grants (subject to eligibility) - Green loans from DBS, OCBC, UOB and other participating Singapore banks (typically 0.2–0.5% interest rate reduction vs. conventional commercial loans) - Green building certification support (BCA Green Mark)

Indicative green financing interest rate saving on S$500,000 facility investment: - At 0.3% annual rate differential over 7-year loan term: approximately S$10,500–S$17,500 total interest saving - This is a secondary financial benefit; primary value lies in electricity cost reduction and ESG positioning

For an energy solutions company or solar/AI service provider engaging Northstar Building, the recurring revenue profile is attractive given the facility's consumption level, ownership structure and multi-service needs.

Indicative Recurring Revenue Model (for Solution Provider):

Revenue Stream	Annual Recurring Revenue Potential	Notes
AI monitoring platform licence	S$18,000–S$36,000/year	Per-site SaaS or managed service
Remote monitoring and alert management	S$8,000–S$20,000/year	Bundled or standalone
Quarterly ESG and energy advisory reports	S$8,000–S$20,000/year	Factorly-powered reporting service
Solar O&M; contract (cleaning, inspection, inverter monitoring)	S$8,000–S$18,000/year	Post-installation annual contract
Predictive maintenance advisory service	S$10,000–S$25,000/year	Premium tier — alerts, reports, recommendations
Total Estimated Annual Recurring Revenue (per site)	S$52,000–S$119,000/year	Subject to contracted scope and service tier

Customer Lifetime Value (CLV) Estimate:

Assumption	Value
Contract term	5–10 years
Annual recurring revenue (base case)	S$80,000/year
Estimated CLV (undiscounted)	S$400,000–S$800,000
Solar system sale (one-time, base case)	S$280,000–S$420,000
Total estimated commercial value of Northstar engagement	S$680,000–S$1,220,000

Value Area	Conservative	Base Case	Stretch
Solar savings (annual)	S$24,900	S$72,100	S$131,600
AI optimisation savings (annual)	S$49,000	S$128,000	S$210,000
ESG / carbon value (annual, incl. RECs)	S$3,000–S$5,000	S$8,000–S$15,000	S$15,000–S$28,000
Energy-company recurring revenue (annual)	S$52,000	S$80,000	S$119,000
Total client annual savings (Solar + AI)	S$73,900–S$78,900	S$200,100–S$215,100	S$341,600–S$369,600
Estimated simple payback — Solar only (Base Case)	—	4.5–6.5 years	—
Estimated simple payback — AI monitoring only	1.0–2.7 years	0.5–1.3 years	0.4–0.8 years
Estimated simple payback — Combined (Solar + AI, Base Case)	—	2.5–4.5 years	—
Estimated 10-year cumulative client saving (Base Case)	—	~S$2,000,000–S$2,150,000	—

Assumption	Value Used	Sensitivity
Electricity tariff	S$0.2972/kWh	High — a 10% tariff change alters solar savings by ~S$6,000–S$15,000/year
Solar self-consumption rate	60–75%	High — lower daytime load reduces savings significantly
AI savings realisation rate	70% of identified potential	Medium — depends on operational cooperation and implementation quality
Operating hours per year	~2,400–3,120 hours	Medium — directly affects consumption baseline
Grid export compensation	S$0.10–S$0.15/kWh	Medium — regulatory and contractual; subject to SP Group approval
Solar system degradation	0.5%/year	Low in short term; material over 25-year system life
REC pricing	S$5–S$15/MWh	Low — minor contribution to overall value

The following scores reflect Factorly's preliminary assessment of Northstar Building's suitability and readiness across ten key dimensions. Scores are on a scale of 0–100, where 100 represents the highest possible suitability or confidence based on available data. All scores are desktop assessments subject to site verification.

Assessment Dimension	Score (0–100)	Rating	Commentary
Solar suitability	68 / 100	■ Good	Concrete slab roof, good condition, equatorial location — constrained by limited declared roof area and multi-storey building form with unknown obstruction level
Roof usability	60 / 100	■ Moderate	10,000–29,999 sq ft declared; significant deductions likely for HVAC, signage, setbacks and terrace areas; drone survey required to confirm
Consumption fit	85 / 100	■ Strong	220,000 kWh/month and S$65,000+/month electricity cost represents a high-value, high-relevance solar and AI monitoring opportunity
Energy optimisation potential	88 / 100	■ Strong	Zero current monitoring infrastructure; large unmonitored load base; chillers and production machines as primary targets; significant upside available
Predictive maintenance potential	75 / 100	■ Good	Chillers and production machines confirmed; maintenance records available; machine breakdowns identified as pain point; IoT infrastructure not yet present
ESG reporting potential	65 / 100	■ Good	Board-level ESG driver confirmed; no existing targets or baseline; strong potential to establish from scratch; methodology framework to be determined

Assessment Dimension	Score (0–100)	Rating	Commentary
Commercial attractiveness	87 / 100	■ Strong	Company-owned, immediate timeline, named decision-maker, large bill, pilot project preference — high conversion probability with right commercial structure
Data confidence	55 / 100	■ Moderate	Single utility bill provided; no interval metering; no equipment list reviewed; no 12-month trend; operating days discrepancy unresolved
Conversion readiness	80 / 100	■ Good	All approval authority in place; named contacts; consent confirmed; immediate decision timeline; commercial model guidance needed
Recurring revenue potential	82 / 100	■ Strong	Multi-service facility with long-term monitoring, ESG reporting, O&M; and advisory needs; estimated S$52,000–S$119,000/year recurring revenue opportunity

Risk Factor	Rating	Basis	Recommended Mitigation
Roof size	■ Amber	Declared area is relatively small for building footprint; actual usable area post-deductions may be conservative	Drone survey to confirm; consider carpark canopy or façade-integrated options if roof area is insufficient
Shading	■ Green	Singapore high solar elevation reduces external shading risk; internal obstructions manageable with good layout design	Drone survey with shading analysis; maintain minimum row spacing in design
Roof condition	■ Green	Self-declared as good condition; exterior building appearance consistent	Physical roof inspection and waterproofing assessment before racking installation
Structural suitability	■ Amber	Concrete slab declared — generally suitable but load capacity for panels, racking and ballast not confirmed	Structural engineer assessment required before system design is finalised
Electrical connection	■ Amber	Multi-storey building; cable routing from rooftop to MSB estimated at 25–50 m; MSB capacity and protection coordination not confirmed	LEW (Licensed Electrical Worker) assessment of MSB, switchgear and cable routing pathways
Grid connection	■ Amber	No existing solar; SP PowerAssets solar application required; grid hosting capacity at this location not confirmed	Submit solar notification/application to SP PowerAssets early; engage EMA-licensed solar installer
Ownership / approval	■ Green	Company-owned; Owner/MD confirmed as decision-maker; no landlord constraint identified	Confirm board/finance committee threshold for capital approval; verify no JTC lease restrictions apply
Data availability	■ Amber	Only one month of utility bills provided; no interval metering; no equipment data reviewed	Request 12 months utility bills; deploy pilot sub-meters; execute data-sharing agreement

Risk Factor	Rating	Basis	Recommended Mitigation
Cybersecurity / data-sharing risk	■ Amber	IoT sensor and AI platform deployment will involve operational data leaving the facility network; no current cybersecurity framework stated	Establish data governance policy; use encrypted data transmission; define data ownership in contract
Machinery data reliability	■ Amber	Equipment list declared as available but not yet reviewed; maintenance records not yet analysed	Share equipment list and maintenance records with Factorly for detailed analysis
REC / green attribute ownership	■ Amber	REC ownership depends on commercial model; PPA structure typically assigns RECs to system owner, not building owner	Negotiate REC ownership terms explicitly in commercial contract before signing
Commercial assumptions	■ Amber	All financial projections based on single bill, declared data and market benchmarks; no formal quotation obtained	Obtain formal solar and AI monitoring proposals from licensed contractors; validate against Factorly estimates
ESG methodology risk	■ Amber	No existing ESG baseline; carbon reporting methodology not yet selected; green financing eligibility not confirmed	Engage ESG advisor to select appropriate reporting framework (GHG Protocol, ISO 14064, etc.); confirm green financing criteria with lenders

Risk Rating Key: Green = Low risk, proceed with confidence | Amber = Moderate risk, verification action required | Red = High risk, resolve before proceeding

Solar Suitability 68/100 Roof Usability 60/100 Consumption Fit 85/100 Energy Optimisation 88/100 Predictive Maintenance 75/100 ESG Reporting 65/100 Commercial Attractiveness 87/100 Data Confidence 55/100 Conversion Readiness 80/100 Recurring Revenue 82/100

Overall Factorly Opportunity Score: 74.5 / 100 — Strong Commercial Opportunity

Risk / Next Step	Current Status	Recommended Action	Urgency
Roof verification	■ Not completed — rooftop not visible in submitted image	Commission drone survey or roof-level physical inspection to confirm usable area, obstructions, drainage and layout feasibility	■ Immediate
Structural review	■ Not completed — concrete slab declared but load capacity unconfirmed	Engage structural engineer to assess slab load capacity for panel weight, racking and ballast; obtain structural report	■ Immediate
Electrical review	■ Not completed — MSB capacity, cable routing and protection coordination unconfirmed	Engage LEW (Licensed Electrical Worker) to assess MSB, switchgear capacity, cable routing pathways and solar connection feasibility	■ Immediate
Utility bill validation	■ Partial — single month only; 12-month trend unavailable; demand charges and power factor not visible	Submit 12 months of utility bills to Factorly for full consumption trend, demand pattern and tariff analysis	■ Immediate
Operating days clarification	■ Discrepancy — 5 days declared vs. 6 days in utility bill reference	Confirm actual operating week with [Name] ; update Fa inputs	■ Immediate
Equipment list review	■ Declared as available but not yet shared	Share equipment/asset register with Factorly for load analysis, predictive maintenance prioritisation and AI monitoring scope design	■ Short-term
Data-sharing agreement	■ Not in place	Execute Factorly data-sharing and confidentiality agreement before sharing operational data, maintenance records or interval metering data	■ Before data sharing

Risk / Next Step	Current Status	Recommended Action	Urgency
Site survey	■ Not completed	Schedule combined site visit: solar designer, LEW, structural engineer and Factorly AI monitoring specialist; aim to complete within 30 days	■ Immediate
AI monitoring pilot	■ Preferred engagement model confirmed as pilot	Scope and price a 90-day AI monitoring pilot covering MSB smart metering, chiller monitoring and production floor sub-meterin proposal to [Name] and Owner/	■ Within 30 days
SP PowerAssets solar application	■ Not initiated — no solar currently installed	Engage EMA-licensed solar contractor to initiate SP PowerAssets solar notification and grid capacity check at 7030 Ang Mo Kio Ave 5	■ Within 60 days
Commercial model decision	■ "Not sure" declared	Present structured commercial options (CAPEX, PPA, lease, pilot-to-full) to Owner/MD with Factorly analysis as supporting documentation	■ Within 30 days
ESG baseline establishment	■ No existing baseline or targets	Engage ESG advisor (or Factorly ESG module) to establish Scope 2 electricity carbon baseline using 12-month utility data; define reporting framework and green financing eligibility	■ Within 60 days
Green financing assessment	■ Not initiated	Contact DBS, OCBC or UOB green financing teams to assess eligibility for green loan or sustainable finance facility linked to solar/AI investment	■ Within 90 days

Risk / Next Step	Current Status	Recommended Action	Urgency
REC ownership negotiation	■ Not addressed	Ensure REC ownership, retirement rights and green attribute allocation are explicitly defined in any solar commercial contract	■ Before contract signing

End of Section 9 and Section 10 — Factorly Preliminary Industrial Energy Intelligence and Solar Feasibility Report

Report complete — all 10 sections delivered.

For follow-up site assessment, AI monitoring pilot proposal or commercial engagement, please contact the Factorly team or your assigned energy solutions representative.

Contact confirmed: [Name] , Head of Building Management — [email]

— Factorly AI Preliminary Assessment Engine — Powering smarter industrial energy decisions.

CE.A.I.
Centre for AI Innovation
powered by MFinB

[End of Report]