



Unlocking New Revenue Streams Through Renewable Energy Certificates (RECs) *Globally and in Vietnam*

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Agenda

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A photograph of a rural scene, likely in Southeast Asia, showing a person carrying a large bundle of harvested rice stalks on their shoulder. A child is standing nearby, also holding a bundle of rice. The background is a lush, green field with trees. The image is overlaid with a semi-transparent blue rectangle containing the word "Introduction" in white text.

Introduction

Executive Summary

Two Levers, One Outcome: More Buyers + Longer Monetization Window → Fewer Unsold RECs and ~US\$3.5–4.4m Net by 2035

Opportunity Statement



With in-house expertise, Stride can **explore different buyer profiles** to **diversify risk** and **climb up the value chain**.



Stride can **buy back the ownership of RECs** from the households to increase their overall volume of RECs.

Overall Expected Financial and Strategic Impact

- Implementing strategy 1 unlocks a **REC profitability uplift** by eliminating most **unsold RECs**. Average **annual profit uplift vs. not implementing** strategy 1: **+16.46 %** on average **per year in the long-run**.
- Strategy 3 adds an entirely **new revenue stream**, worth **~\$3.5–4.4 million** by 2035, using **RECs that Stride currently earns nothing** from.

Diversify beyond PowerTrust to exchanges and alternative brokers



Keep going with PowerTrust

- Remaining RECs via exchange platforms (REDEX and CIX)



Explore direct contracts with bigger companies

- Keep working with brokers at the same time



Internalize the MRV and deal B2B directly

- Further invest in in-house expertise and operation

Extend monetization beyond 2-year financing window

Cash Buy-Back

- Small cash reward, customers assign post repayment REC right



Providing Insurance

- Stride pays the premium, customer receive insured panels



Maintenance

- In-kind break & fix service delivered via EPC partners



Primary and Secondary Research



Southeast Asia
**Renewable Energy
Certificate (REC)
Ecosystem**

SIEW – Singapore
International Energy
Week

Altercop 30 Singapore
VCM investment
conference

Captured insights across
the **full REC ecosystem**
to understand the its
landscape in SEA

Focus on understanding

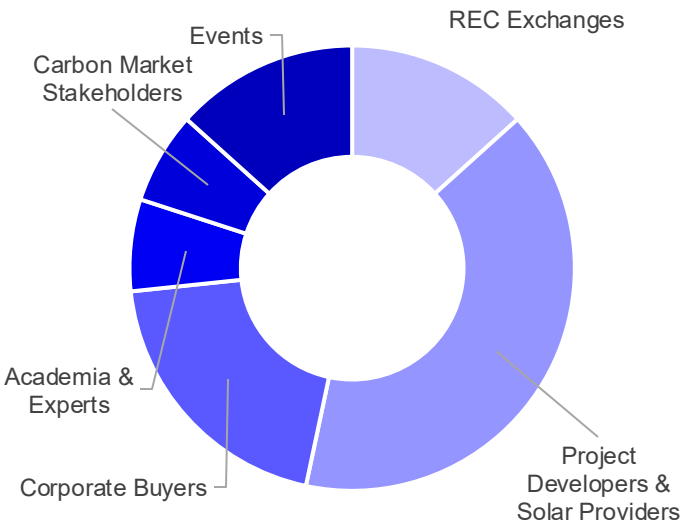
- 1

REC supply, trading mechanics, demand signals, and price drivers.
- 2

Operational bottlenecks and regulatory challenges.
- 3

Emerging areas like decentralized/community RECs (D-RECs) and Linked carbon markets (VCM, Article 6).

Companies Interviewed



- REC Exchanges
 - ESC Energy Smart Community
 - Climate Impact X
- Project Developers & Solar Providers
 - Keppel
 - ESR
 - ENERGIX
 - ES
- Corporate Buyers
 - GoNetZero
- Academia & Experts
 - NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
- Carbon Market Stakeholders
 - INFRABLOCKS Technologies
- Events
 - AlterCOP 30
 - SIEW SINGAPORE INTERNATIONAL ENERGY WEEK

Interviewees

- Interviewees provided us insights on current trends and practices in the REC industry.
1. REC Exchanges → Insights on who are current sellers and buyers in their platforms
 2. Project & Solar Developers → How they procure and buy RECs for more projects
 3. Corporate Buyers → DPPA's current buyers
 4. Academia & Experts → Future of grids
 5. Carbon Market Stakeholders → Favourability of RECs against VCCs

Midterm Presentation Recap – Growing Sustainability Effort

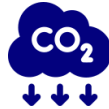
Renewable Energy Projects and Instruments are Gaining Traction as Governments and Corporates Aim to Reduce Greenhouse Gases

Renewable Energy Landscape

Growing demand in renewable energy projects due to...



Climate Impacts
Require more clean energy to transit away from fossil fuels

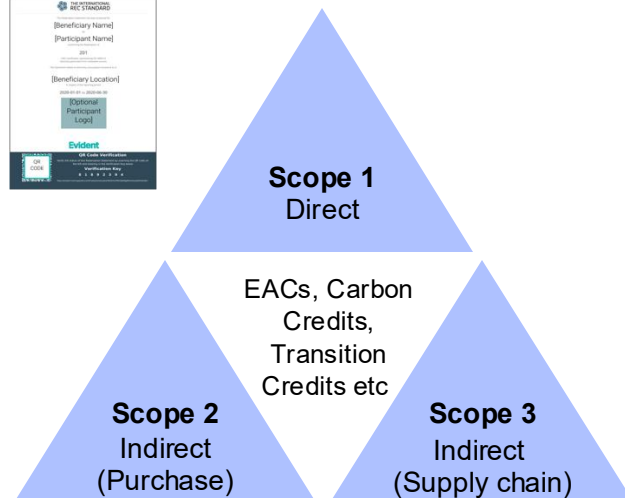


Regulations & Targets
CSRD, carbon pricing, and net-zero targets (RE100, SBTi)



ESG Performance
Drive voluntary renewable energy purchases

Renewable energy projects produce **carbon instruments**



58.23B
CAGR
10.05%

REC Market **Global**
Projected Value (by 2032)

1 REC = 1MWh

A digital asset to **offset non-renewable electricity** consumption

Stride's Relevance

Within the different types of RECs, Stride qualify for D-RECs

D-RECs Initiative

1. D-RECs = High-impact verification label
2. Launched in 2021 by **South Pole & Positive Capital Partners**
3. To address the lack of access to clean energy in the underserved communities

D-REC highlights the additional **social & economic** impacts with premium pricing (~USD 26/MWh)

What is a D-REC?



- Distributed Renewable Energy Certificate
- 1 MWh of renewable electricity
- Small-scale, distributed energy systems



It is a unique strength for stride...



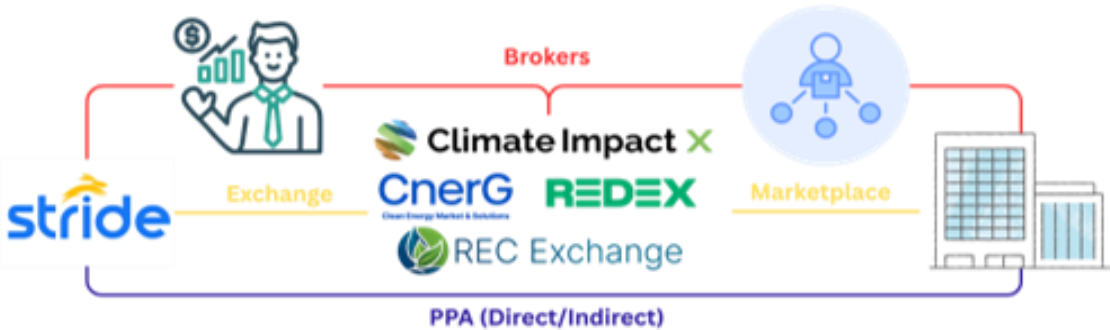
- Distinct rural household projects with strong **social & economic** impact, qualified for **D-REC certification**
- Proven ability to attract **premium buyers** (Netflix, Salesforce, Microsoft) through measurable impact stories
- RECs revenue for stride could **4x by 2030**, assuming a 20% YOY MWp annual growth (our forecast)

Stride should **leverage RECs ownership** and **premium D-REC prices** to expand a **steady secondary revenue stream**

Midterm Presentation Recap – Diversifying the Sales of RECs

Stride is Currently Dealing with PowerTrust (Broker) to Sell its RECs, but it Can Explore Other Channels and Values Chains

Three Main Sales Channels



Direct PPA (Highest Margin | Most Effort)

- Buyers & sellers negotiate directly – forward/long-term contracts etc.

Brokers (Medium Margin | Least Effort)

- One or two brokers matching buyers & sellers

Exchanges (Fastest | Transparent)

- Sellers register & report RECs, and list them on the platform for sales

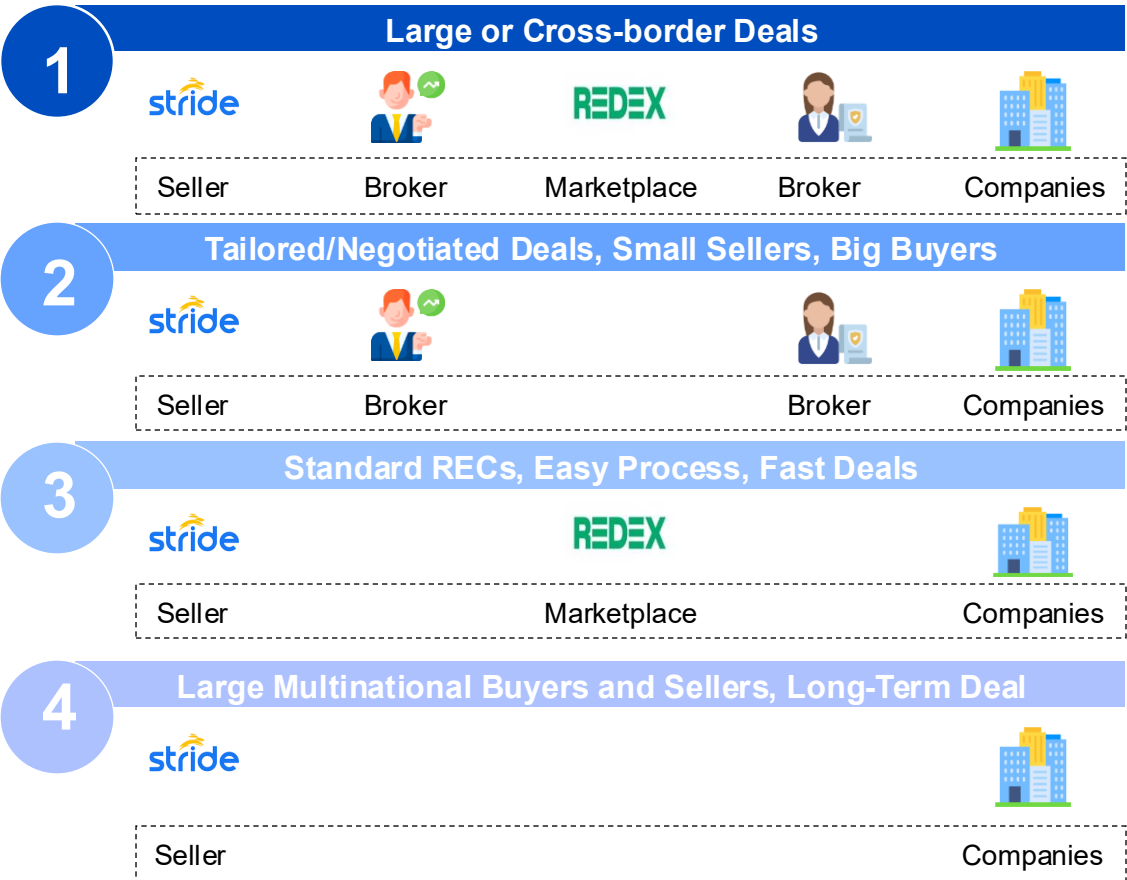


Main Concern:

- Limited REC volume and high number of projects restrict potential for Direct PPA and diversification with brokers or exchange

Margins and sales effort depend on the sales channels

Four Types of Value Chains



Shorter value chains = Higher margin possibilities

Midterm Presentation Recap – Maximize REC Value for Stride

There Are Untapped Operational Gaps for Stride to Invest more Resources In

	 	   		
	Strategy 1: New Buyer Profiles	Strategy 2: Reinvestment Strategies	Strategy 3: Buy-back Options	
Gaps	Operations and income from RECs are fully dependent on PowerTrust	Excess REC revenue sits idle instead of funding core market growth	Loss of REC ownership after financing period, and RECs' value goes to waste	
Opportunities	Find potential buyers other than PowerTrust - Develop alternative channels	Redeploy capital into Stride's deferred-payment solar-financing operations or forward contracts for liquidity	Buy back RECs from past clients once ownership transfers to get recurring revenue	
Positive	Builds resilience, enhances transparency, avoids middlemen.	Improves capital efficiency and ESG risk alignment.	Potential 15x lifetime value increase per REC system, access bigger clients, no extra capex	
Negative	Broker switch is effortful, hard to optimize risk/reward	Success depends on scaling loan portfolio; deferred-payment model has execution risk	More effort to purchase back RECs, uncertain of customer concerns	
Proceed?	<u>Yes</u>	<u>No</u>	<u>Yes</u>	



Strategy 1 - Suitable Buyer Profiles

Three Buyer Suggestions

Considering the Best Buyers with the Most Attractive Returns and Least Amount of Effort

Main Goal: Get **closer to the end buyer** to eliminate any **excess costs and shorten the value chain**, while considering the **risk and return preferences** of Stride.



	Buyer Profile 1	Buyer Profile 2	Buyer Profile 3
Who are they?	D-RECs from brokers	RECs from exchange platforms	REC Bilateral Agreements (DPPAs)
Advantages	- Highest Returns from D-RECs - Brokers handle verification and sourcing directly with project developers - Offers storytelling value, ability to trace renewable energy impact	- Facilitate exchanges between seller and buyer, working for the interest of Stride - Transparent fees, sure sale	- Hedged prices from buyer and seller - Long term agreements, 10-15 years - Low effort to consistently register and sell RECs
Disadvantages	- Limited price transparency compared to open exchange markets - Limited willing customers	- Transaction fees - Less opportunity for brand storytelling - Price volatility driven by market - Lower returns compared to D-RECs	- Requirement of high MW needed for end-customers - Not currently recognising impact
Stride Compatability	High compatibility, aligned with D-REC initiative with high returns	Medium compatibility, medium risk and medium returns	High compatibility, aligned with D-REC initiative with high returns
Recommend for Current Stride Model?	<u>Yes</u>	<u>Yes</u>	<u>No for now, Yes in the Future</u>

(1) Stride's Current Business Model with D-REC Brokers

Comparing PowerTrust to South Pole

Current Business Model



Seller > Broker(s) > Buyer [for tailored/negotiated deals, small sellers, big buyers]



Comparison: PowerTrust vs South Pole



D-RECs

Best for Impact Projects

Company focuses on impact-projects, ESG impact, and storytelling with their REC projects

Limited Supply of Buyers

New initiative, limited buyers are aware and willing to pay the premium – historically having short-term contracts

D-RECs and I-RECs

Best for Compliance

Corporations approach South Pole to comply with RE100 and reduce Scope 2 as South Pole focuses more on I-RECs

Large Presence Globally with Multiple Corporate Buyers

Presence in multiple countries providing the broker with more contacts – especially with cheaper I-REC prices

Brokers register RECs, find the end customer, and finalize the contract terms; this means **little effort from Stride is needed** while still selling RECs at a premium price of \$26. **Staying with PowerTrust is also more suitable** as it requires less onboarding and they provide identical services as South Pole.

(1) Continuing with PowerTrust

More Beneficial to Stick with External Brokers with D-RECs Being a New Initiative

Pros

1



One of Few D-REC Brokers

"PowerTrust might be more favourable since they are one of the only D-REC brokers in the world, which recognises Stride's impact-focused projects"

2



Attractive Prices with Limited RECs procured

"If you are thinking to come to us (CIX), unfortunately, we cannot match the current prices they are offering - especially as Stride procures few RECs"

3



Making Best Use of Limited Grid Development

"I would suggest selling them as bundled RECs but since the APG is not developed yet from Vietnam to SG, it might be good to stick to PowerTrust for now"

Cons

1



Hidden Prices Sold to End Customers

"In the future, when Stride procures more RECs, it would be better to have a long term contract with a bilateral agreement straight from the buyer – reducing uncertainty and knowing the price."

2



Furthest Path to End-Consumer

"I believe you should try reframing the problem to reaching the end customer with fewer stakeholders in between. This agreement reduces risks while locking in an attractive price."

3



D-REC Initiative is still new and developing

"I am unfamiliar with whether bilateral agreements or exchanges are supporting this initiative. Maybe when it is more developed, there is more flexibility in choosing the end customer?"

Stride should **CONTINUE** with PowerTrust as they provide the most attractive returns, while recognizing the impact-focused initiatives they support.

(2) Exploring Exchange Platforms

Exchange Platforms Offer Transparency while Having the Largest Customer Base

Business Model



Any size



Combine & Tailor



Usually big corporates

They have **different revenue model depending on project type** and volume side



Transaction Transparency

- Trades are recorded and visible, enabling clear price discovery that reflects real-time supply and demand



Standardization

- Standard contracts and certification cut negotiation time and reduce compliance risk for buyers and sellers



Liquidity & Flexibility

- Sellers can offload RECs via spot or forwards (partially or fully), which is useful during demand swings or near compliance deadlines



Technology Integration

- API-driven registries automate REC issuance, tracking, and retirement, reducing manual work

Comparison: REDEX vs CIX

Exchange platforms currently **DO NOT support D-RECs**

REDEX

I-RECs and TIGRs

Accessible for Small Projects

Suitable for smaller or more fragmented sellers with smaller lots and require flexible onboarding

Tech for Small Assets

API-integrated to automate onboarding even for distributed rooftop assets



I-RECs only

Best for Medium/Large Volume

"Easier for volumes >1000 RECs as they have a clearing service...charge about 5 cents per REC"

Not applicable for D-RECs

Most corporate buyers are not familiar with the concept

Both platforms collect transaction fees, but broker and platform charges can vary, emphasizing the importance of matching deal size and registry (refer to appendix for pricing information)

(2) Utilising Exchange Platforms for Excess RECs

How Exchange Platforms Enable Diverse REC Selling Strategies

Pros

1



Broader Buyer Pool & Price Discovery

"Exchanges offer access to multiple buyers and sellers so there is more reach and transparency. You will know the market-informed pricing"

2



Flexible Strategic Selling Options

"These platforms provide transparency and liquidity, enabling participants to easily buy and sell RECs... Participants can speed up their REC sales and save on administrative costs."

3



Ability to Sell Small-Scale Project RECs

"Exchange usually put different RECs that satisfy the buyer requirements, into the same basket to sell them as a whole"

Cons

1



Lower Premium for When Not Sold as D-RECs

"Most exchanges centre on standardized or mainstream RECs, meaning boutique products (high-impact, D-REC) are not traded in the platform yet.... but can sell as normal RECs"

2



Commoditization

"Large buyer pools result in more 'commoditized' pricing, making it harder to tell impact stories or capture unique value for stand-out projects"

3



Margin Concerns for Small Project Sellers

"While exchanges reduce barriers, "many projects of small scale" would increase some costs like onboarding or registration fee per project if the exchange revenue model is not commission-based"

Stride can leverage exchanges for reach and operational flexibility but should pair with targeted broker/direct sales to maximize premium value and protect small project margins. **For instance, excess RECs can be sold through exchanges to maximise returns.**

(3) Future Potential with Direct Power Purchase Agreements

DPPAs Offer Long Term Contracts at Attractive Prices and Low Risk

Business Model



Any size

Negotiate & Build
Contract Directly

Usually big corporates

Through Direct Power Purchase Agreements (DPPAs)...



Large Corporate Buyers

Corporations such as large data centres or governments engage in DPPAs as they have a large non-renewable output



Flexible Contract Terms

Contract terms can span for 10 years with set prices – depending on negotiations with the end-customer. Some contracts for example price RECs at \$20



Prices are hedged, reducing risks

Prices are locked in as set in the contract, reducing risk for the seller when prices of RECs become unstable or decrease

Pros and Cons

1



High Returns, Low Risks

“As a business development manager, I always recommend my customers to have DPPAs as their end goal as it maximises profit while having the least risks.”

2



Long-Term Contract with End Customer

“We (data centres) usually only engage in DPPAs as it requires low effort throughout the many years as the contract is already set. This makes it easy to negotiate terms as well.”

3



Large Number of RECs Needed

“We (SolarTrix) also produce RECs but because it is so little, we never considered DPPAs because there are no buyers.”

4



Does NOT Recognise Impact

“One of the benefits PowerTrust offers is adding the impact-initiative as a value added to the overall price. For regular DPPAs, you do not have that.”

Since Stride does not procure enough RECs for a DPPA, they are unable to directly go to end-customers. Nonetheless, **when they reach >1.75GW, they should consider these bilateral agreements** as it provides the least risk and most returns.

Buyer Profiles in Short

Summarising the Differences Between All Buyer Profiles

Buyer Profile 1: Brokers



- **Most attractive returns** – priced at \$26 for D-REC standards
- Least effort needed as PowerTrust handles registration up to sale
- Minimal effort needed to change broker – continue current contracts with PowerTrust
- Impact is recognised

- **Limited information on end-price**
- Uncertain for future buyers as D-REC initiative is still growing

Continue with PowerTrust due to: best returns, minimal effort, and convenience

Buyer Profile 2: Exchange Platforms

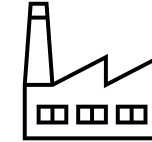


- **Multiple customers in the platform**
- No hidden fees, transparent prices
- Able to aggregate MW from small projects and sell to end-consumer

- **Medium returns**
- **Does not recognise impact from initiatives**
 - Not under the D-REC initiative

If Stride has EXTRA RECs, they can sell it on REDEX

Buyer Profile 3: Direct-to-Consumers



- **Long term contracts** – ensuring low risk and **hedged prices** despite fluctuations in the market
- Opportunity to leverage factories and scope 3 emissions in Vietnam servicing large MNCs
- Attractive returns, low risk

- **Requirement to have an average of 1.75GW**, as usual customers require a lot of MWs
- As of now, does not recognise impact
 - Potential for future D-REC bilateral agreements

When they reach 1.75GW, they should consider DPPAs with scope 3 producers of multinational corporations

How Our Cost–Benefit Model Evaluates Strategy 1

Modelling How Different Sales Channels Impact Stride's Margins over Time

The cost-benefit analysis of strategy 1 models how **profit is expected to increase if strategy 1 was to be implemented**. It is constructed based on **three cases in the short, medium and long-run**:

1

Short-term

Sell mostly via **PowerTrust +**
Leftovers through
exchange platforms

2

Medium-term

Keep contracts with
brokers + exchange
platforms, but start
entering **contracts**
with **companies**

3

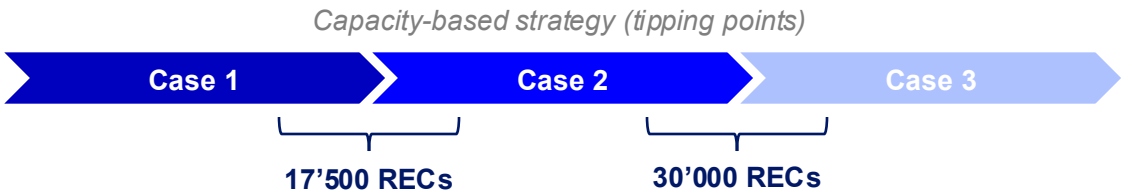
Long-term

Internalize the REC
trading process and
engage in direct
contracts

Revenue & Fee Assumptions Linked to Buyer Profiles

	Sales price	Trading fees	Variables	One-time fees
POWER TRUST	USD 30,59	15%	USD 0,00	USD 0
<i>Direct Contract</i>	USD 31,00	0%	USD 0,00	USD 0
RED EX	USD 0,60	1%	USD 0,03	USD 100

Multi-Year Profit Forecast



Using **expected REC volumes** from 2025–2045, the model computes:

1. Net annual profit under each case
2. Cumulative profitability over time

>> When should Stride shift from its current model to more profitable channels?

Operating Costs & Optional Add-Ons

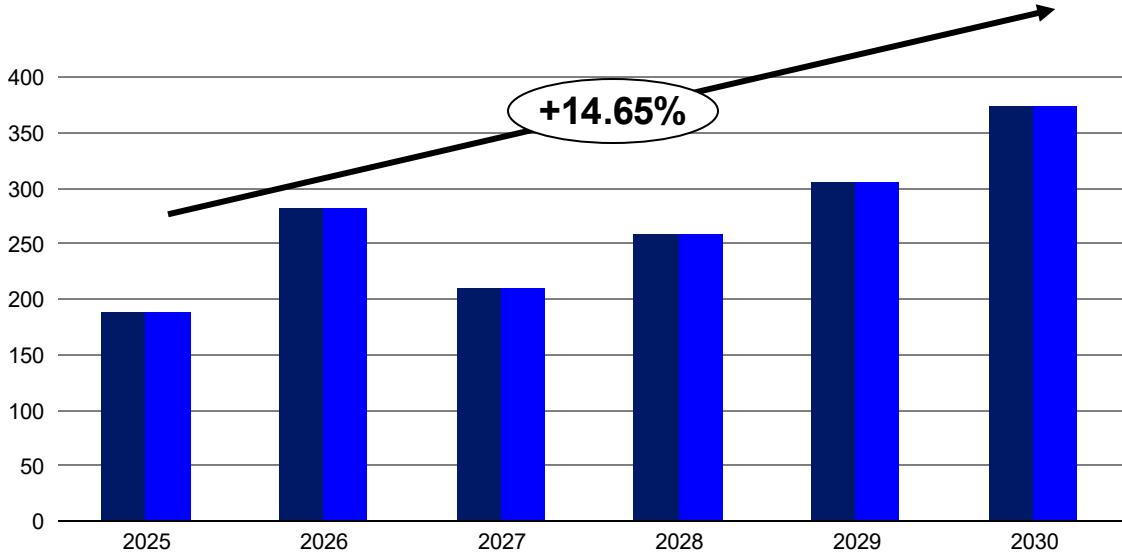
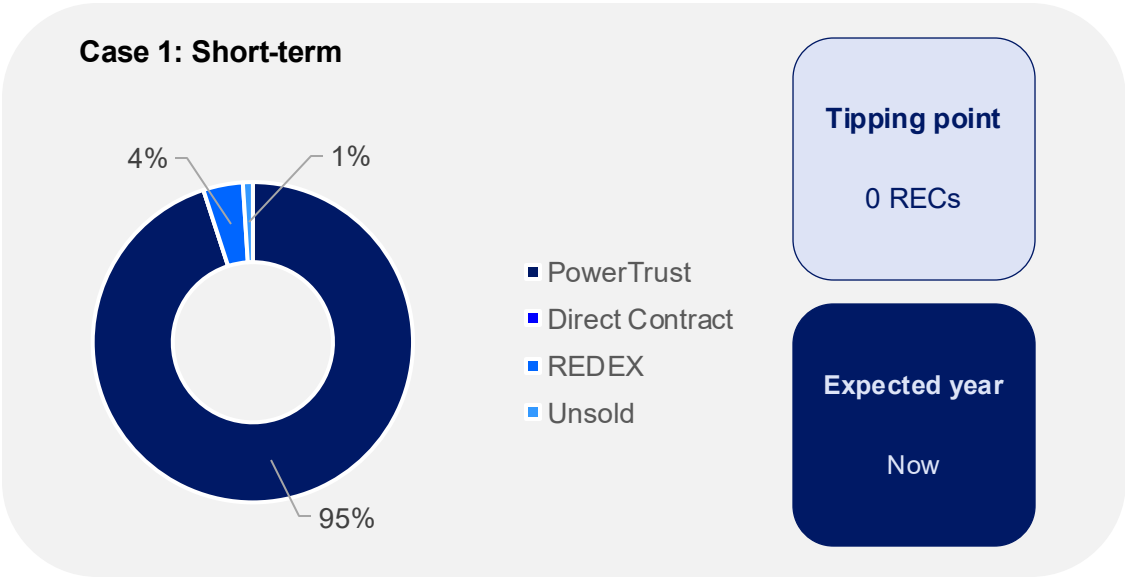
The model integrates:

- **Annual overhead costs** required for each operational setup
- A **toggle (YES/NO)** to include future **Strategy 3 buyback RECs**

Purpose: Quantify the cost of scaling REC activity and allow testing of long-term extensions.

Our Recommendation: Case 1 – Short-Term

Keep Buying from PowerTrust for their premium pricing. Unsold RECs Through the PT Can be Traded via Exchange Platforms such as REDEX and CIX



Costs vs Revenues



- **Sale of D-RECs** through PowerTrust: **premium pricing ~\$26 per REC**
- **Surplus I-RECs** sold through REDEX when volume > D-REC demand: **Vietnamese I-REC pricing at ~\$0,50 - 0,70**



- **Brokerage fees:** negotiable, can vary anywhere between **1-20%**
- **Minimal overhead** of coordination, negotiation, reporting: **USD 500**
- **Platform fees** for device registration, redemptions, seller processing fees: **fixed cost of USD 100 + 3 cents / REC + 1% of trade value**

Revenues are driven almost entirely by **premium D-REC pricing**, while **costs remain minimal** because all MRV and admin work is outsourced to brokers.

Conclusion

Case 1 suggests that in order to maximize the short-term gains, Stride should continue to sell most RECs through brokers (PowerTrust).

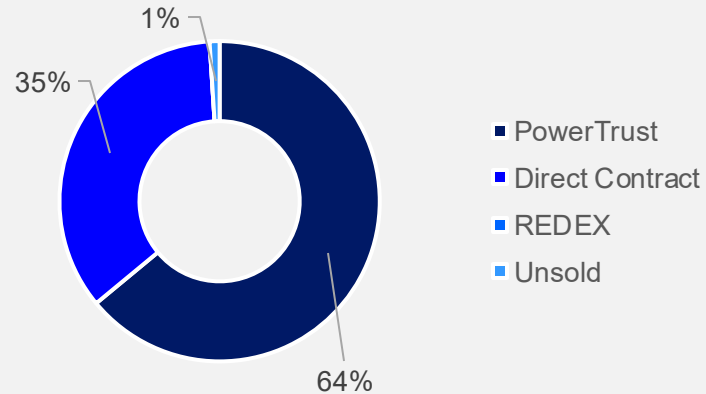
Stride captures premium D-REC prices with almost no internal effort, while exchanges help eliminate unsold volumes. This setup maximizes returns at current scale and preserves operational simplicity.

- **Average annual profit uplift vs. not implementing Case 1: +0.05 % (during 2025–2030)**

Our Recommendation: Case 2 – Medium-Term

Start Entering Direct Contracts with Bigger Companies. Keep Working with Brokers

Case 2: Medium-term

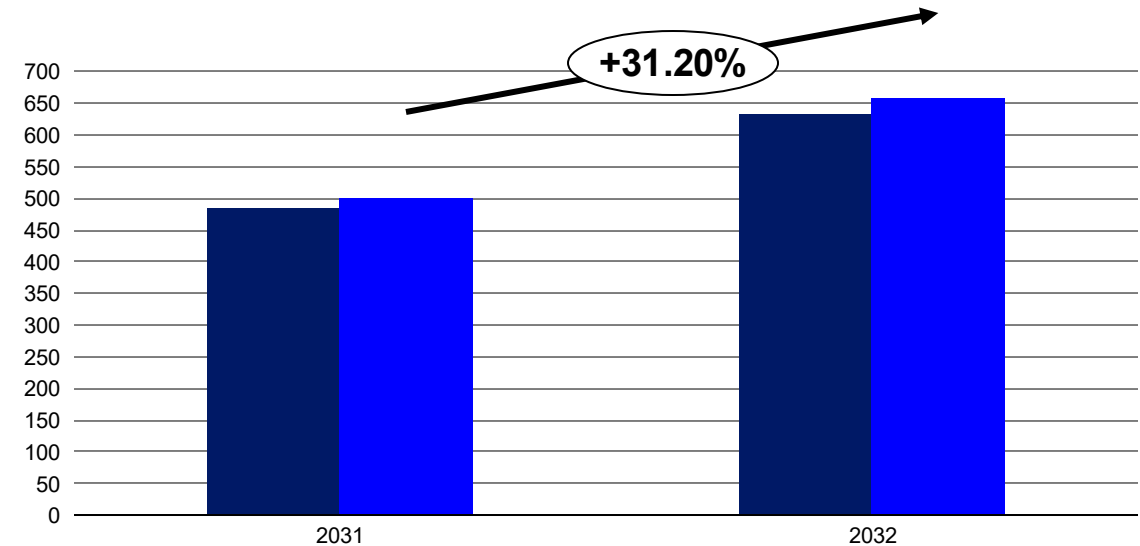


Tipping point

17'500 RECs

Expected year

2031E



Costs vs Revenues



- D-REC sales through PowerTrust: **premium pricing ~ \$26**
- D-REC sales through direct contracts with big corporates of **premium ++ pricing ~ \$30-40**
- Surplus I-RECs at **~\$0,50 - 0,70**



- **Brokerage fees** (via PowerTrust), can vary anywhere between **1-20%**
- **Exchange platform fee on REDEX: 1%** trade value, **USD 0.03 per REC**
- **Higher operational overhead** vs Case 1 (managing brokers + direct contracts + platform): **USD 20'000**

Revenues diversify through **exchanges and first direct deals**, but coordination and platform fees introduce **more additional fixed costs**.

Conclusion

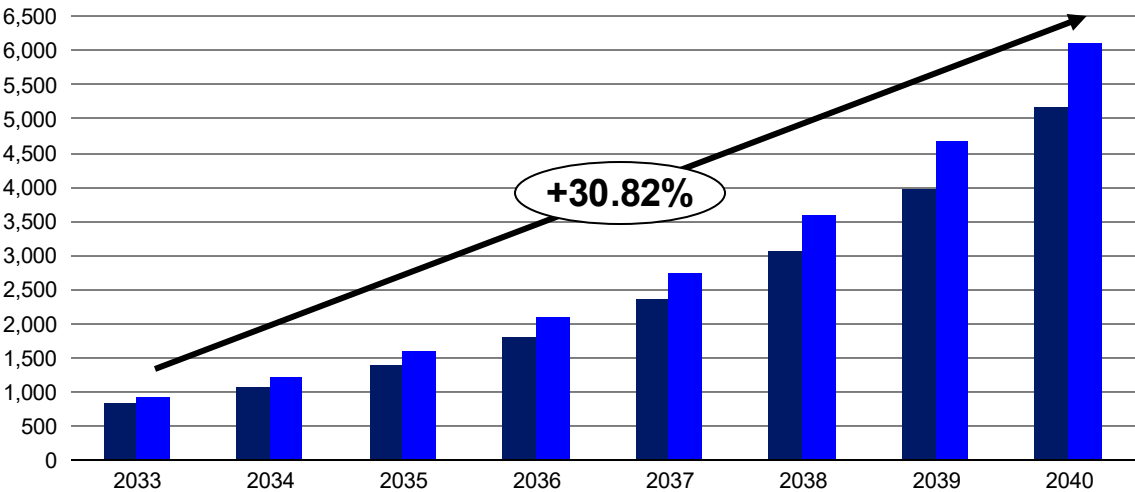
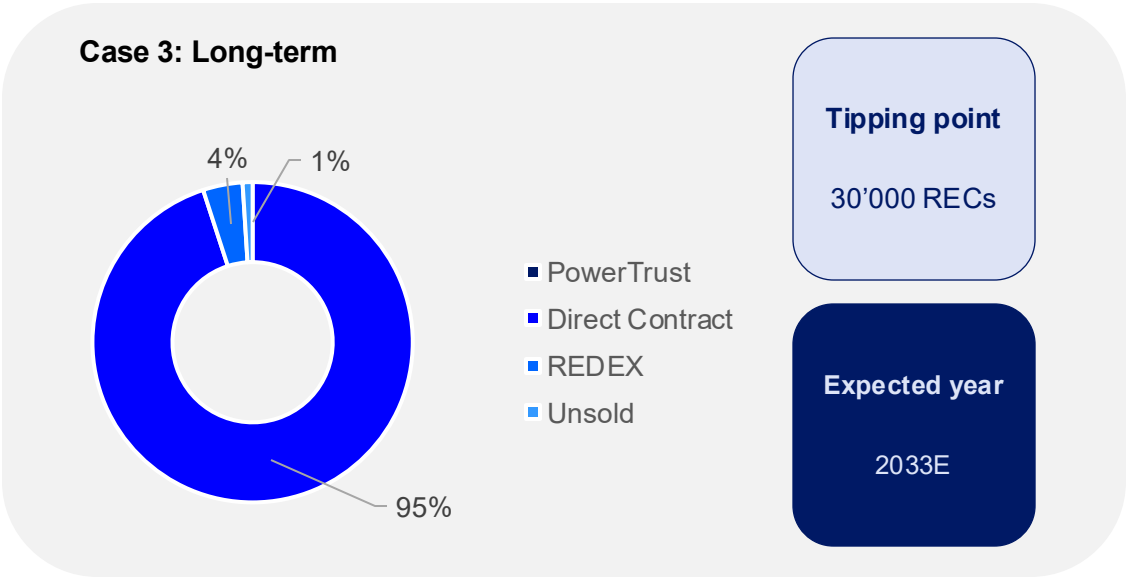
Case 2 becomes financially superior once volumes rise, combining brokers, exchanges, and the first direct corporate contracts.

Stride reduces broker dependence, captures higher margins on part of its REC portfolio, and ensures full volume monetization. The hybrid model increases profitability while keeping internal complexity moderate.

- **Average annual profit uplift vs. not implementing Case 2: +3.62 % (during 2031–2032)**

Our Recommendation: Case 3 – Long-Term

Internalize the Brokering Part into Stride



Costs vs Revenues



- **D-REC sales** through direct contracts with big corporates of **premium ++ pricing ~ \$30-40**
- **Surplus I-RECs** at **~\$0,50 - 0,70**



- **Internal MRV** (measurement, reporting, verification) **capability building**
- **Higher staff & administrative overhead**
- **Device registration + issuance costs** (if Stride begins issuing I-RECs itself)

Direct contracting requires Stride to **absorb MRV, reporting, and staffing costs** previously handled by intermediaries.

Conclusion

Case 3 unlocks the highest profitability by fully internalizing REC trading and contracting directly with corporates.

By eliminating intermediary fees and securing multi-year deals, Stride captures the full REC margin. Although MRV and compliance costs rise, scale quickly dilutes these overheads. Once Stride exceeds ~30,000 RECs/year, Case 3 offers the best long-term value.

- **Average annual profit uplift vs. not implementing Case 3: +16.46 % (during 2033–2040)**

Summary of Our Recommendations

A Phased Roadmap to Maximize REC Sales, Reduce Fees, and Eliminate Unsold Volumes



Current Strategy 2025

- **PowerTrust** as a broker
- High majority (almost all) RECs being sold through PowerTrust
- Rest of the **RECs are left unsold**
- Sold at **26\$ as D-RECs**
- **Low effort, attractive returns** through D-RECs.



Milestone 2 17'500 RECs (1.75GW) / year (2031E)

- Enter into **direct contract with companies** (start internalizing the process)
- Keep contracts with **brokerage firms & exchange platforms**
- High effort, higher profit

#1 Current Model

#2 Short-term

#3 Medium-term

#4 Long-term

Milestone 1 (2025)

- Keep going with PowerTrust as a broker
- Can still be sold at **premium D-RECs prices**
- Register on **REDEX to sell remaining RECs**: No RECs left unsold
- **Low effort, attractive returns** through D-RECs



Milestone 3 30'000 RECs (3GW) / year (2033E)

- **Internalize** the RECs trading process
- No brokerage / exchange platform fees
- **Build internal MRV capacity**
- **Maximize profit, low effort & low risk** after contract is signed



Stride should **keep going with PowerTrust**. To avoid being left unsold, Stride could **simultaneously register on REDEX** to trade the remaining RECs. Later on, the goal is to **move to DPPAs with bigger corporate buyers** from Singapore, targeting their scope 3 emissions in Vietnam while still agreeing to a price range from Singapore RECs.

The background image shows two people in a rural, agricultural setting. On the left, a young child stands holding a bundle of harvested rice. In the center, an adult is seen from the back, carrying a large, heavy load of harvested rice on a wooden pole balanced across their shoulders. The scene is set in a field with tall grass and a body of water in the background. The entire image is overlaid with a semi-transparent dark blue filter.

Strategy 3 - Buy-back of Customer RECs

Only ~2 Years of RECs Monetized; 30+ Years Go Unused

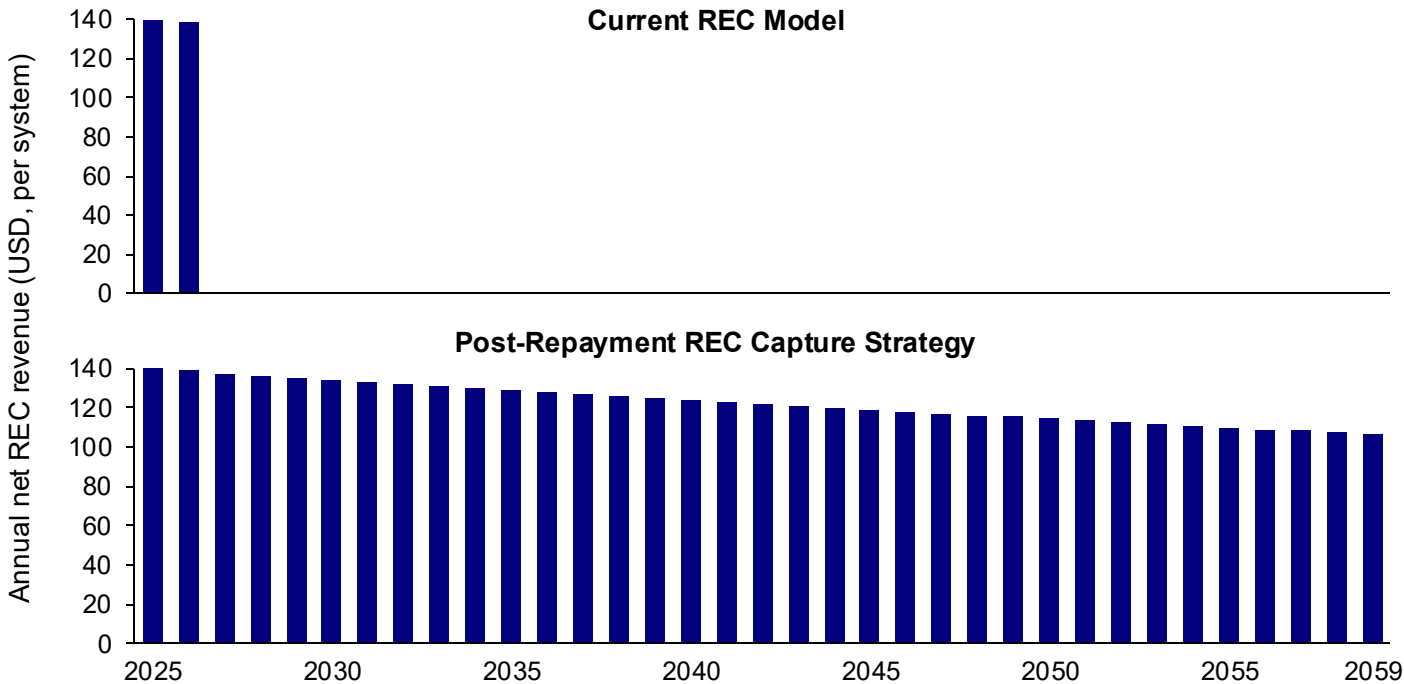
Most Customers Don't Use or Sell RECs after Payoff. A Simple Buy-Back Changes That

System Profile (Household)

Parameter	Value
System size	7.9 kW
Capacity factor (CF)	7.8%
REC price	\$26/REC (net to Stride)

Total REC Revenue

- Current model: ~\$278 over a 2-year period
- Post-repayment REC capture strategy: ~\$4'283 over a 35-year period
- **15.4x lifetime monetization potential** (no additional capex)



Current State

- Under the current model, **Stride owns** and monetizes RECs only **until the loan is fully repaid** (≈ 2 years).
- **After** payoff, **RECs belong to the customer**.
- In practice, awareness and access are low, so **most post-repayment RECs are never sold** or retired.

Opportunity

- At payoff, obtain in-app consent to assign **REC rights to Stride** in exchange for a small, visible **benefit** (cash, insurance, or maintenance).
- Stride then aggregates these long-tail RECs and **sells them via the channels already mapped** (PowerTrust / REDEX / direct).

Why It Matters

- Same physical asset, **no new capex**.
- Extending rights **converts ~2 years → up to ~35 years of monetization per system**, adding a durable revenue layer with light operational overhead.

Source(s): Stride operational data (Baseline 2024; AIIIF II Metrics 2Q2025), interview with CEO (Sep 2025), and external PV performance benchmarks (Kirmani & Kalimullah 2017) (see appendix for more details) and own calculations (REC Revenue Excel Model)

Notes: Single-system illustration. Assumptions: degradation rate 0.8%/yr; REC Eligibility (Current Model) 2 years; REC Eligibility (Extended Case) 35 years (panel life)

Incentives Turn Idle RECs Into Revenue

Solution Steps and Resulting Advantages



Our Solution

Capture consent at payoff. One-tap, in-app consent to assign post-repayment REC rights to Stride

Offer clients
**simple
incentives**

Cash buy-back: Small cash payment per REC. “Free money” from an asset the customer wasn’t using

Insurance: Stride pays a third-party insurer. The customer gets insured panels instead of cash

Maintenance: Stride (+ partners) handles maintenance. Support delivered in kind rather than cash.

Bundle these “legacy RECs” with Stride’s active portfolio to **increase total REC volume**

Sell via the channels proposed in Strategy 1 (PowerTrust, South Pole, REDEX, direct)



Advantages



Unlocks long-tail revenue (potential ×15 increase in lifetime REC value per system)



Volume = pricing power: larger blocks improve access to premium buyers



Channel fit: Uses Strategy 1 sales routes; adds volume, no new integrations needed.



Creates shared value: customers receive visible benefits from assets they weren’t monetizing



Customer relationship: Ongoing engagement with visible benefits → higher re-engagement and referrals



No additional capex: uses existing solar assets and data infrastructure. Added operational tasks are accounted for in the cost model

Modelling REC Eligibility and Incentive Scenarios

Forecasting Stride’s Monetisation Potential With/Without Post-Repayment REC Capture Strategy and Cash Buy-Back, Insurance, or Maintenance Incentive

What this model does

- **Portfolio REC Model:** Forecasts annual RECs & revenue for Stride’s entire fleet as capacity scales
- **Unit REC Economics:** Estimates MWh → RECs → \$ over 35 years for an average rooftop system (with panel aging)

Post-Repayment REC Capture Strategy

- **No** (current state): REC income ends after asset repayment
- **Yes** (strategic option): Extend REC rights via secondary contracts post-repayment

Customer incentive toggle

- **Cash buy-back**
- **Insurance**
- **Maintenance**

Input Lever	Purpose	Base case
Growth of installed MWp	Drives capacity expansion	2026–28: 50/41/36%; 2029+: 30%
Ownership window	Defines REC eligibility period under current vs extended model	2 years (current), 35 years (extended)
REC price (net)	Converts RECs → Revenue	\$26/REC (net to Stride)
Program overhead	Fixed costs to run the scheme	One-off (launch): \$35’000 Annual: \$25’000
Incentive cost: Cash buy-back	Customer payout rule for cash option	50% of net REC price with \$0.25 floor / \$6.00 cap (per REC)
Incentive cost: Insurance	Third-party policy paid by Stride. Converted to \$/REC	\$3.89/REC
Incentive cost: Maintenance	Break/fix service delivered in kind. Converted to \$/REC	\$5.36/REC

Computation logic

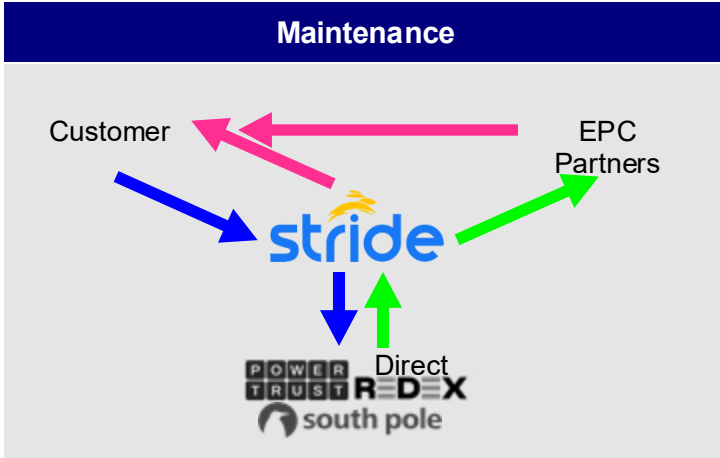
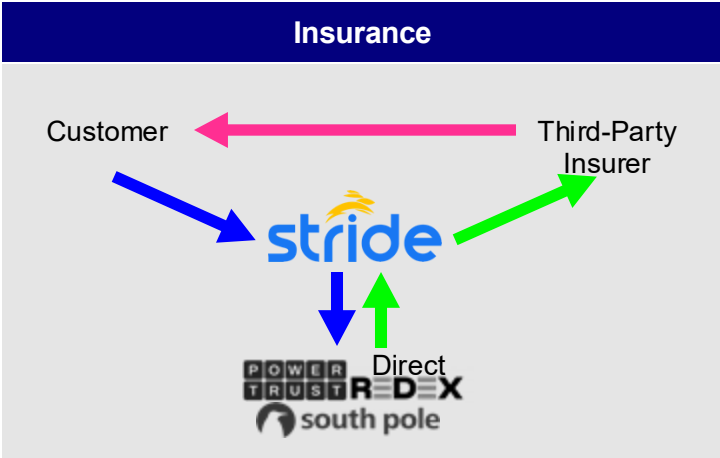
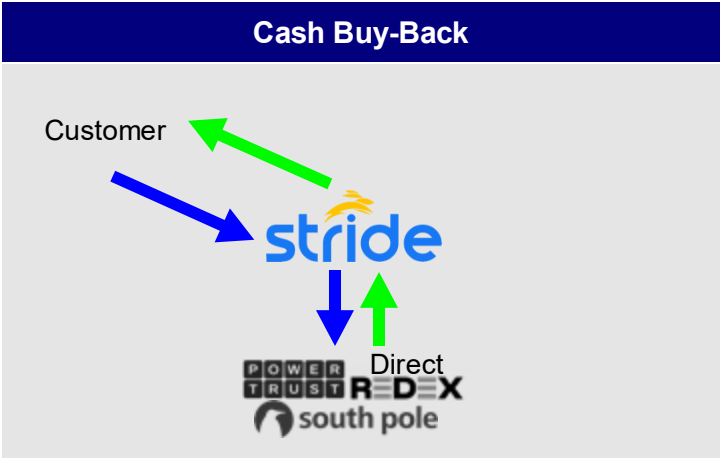


Source(s): Stride operational data (Baseline 2024; AIIF II Metrics 2Q2025; Stride AIIF II IC 2024), interview with CEO (Sep 2025), interview with GetSolar (Nov 2025), National University of Singapore et al., 2020, and Salaryexpert, n.d. (see appendix for more details)

Notes: 1: Adoption used in base: opt-in 85%, opt-out 6%/yr (see appendix)

Choose the Customer Incentive: Flows at a Glance

Cash Buy-Back, Insurance, or Maintenance: Who Does What, and What Flows Where



Customer → Stride: Assigns post-repayment REC rights

Stride → Customer: Pays cash per REC

Stride → Channels: Sells aggregated RECs

Channels → Stride: Pays net proceeds

Customer → Stride: Assigns post-repayment REC rights

Stride → Third-Party Insurer: Pays the insurance premium

Third-Party Insurer → Customer: Provides coverage

Stride → Channels: Sells aggregated RECs

Channels → Stride: Pays net proceeds

Customer → Stride: Assigns post-repayment REC rights

Stride → EPC Partners: Pays the required repairs

Stride + EPC Partners → Customer: Provides break/fix maintenance

Stride → Channels : Sells aggregated RECs

Channels → Stride: Pays net proceeds

Cash Buy-Back: Share Value, Scale REC Monetization

Operating Model Snapshot: Cash Buy-Back Flows, Payout Rails, and Risks/Benefits

Incentive Logic



Customer assigns **post-repayment REC rights** to **Stride** (one-tap, in-app)



Stride pays **cash per REC** using **payout rails**: **50%** of net REC price with **\$0.25 floor / \$6.00 cap** (per REC)



Stride sells the RECs via Strategy 1 channels and **keeps the spread**

Pros



Feels **fair** → higher adoption. Customers see cash per REC for **idle rights**

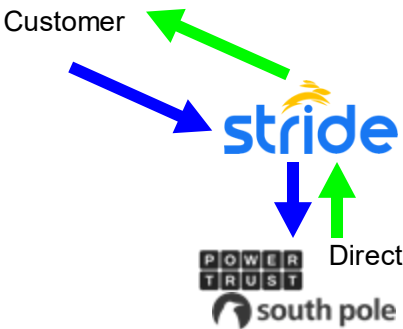


Auto-tracks market. Payout moves with the REC price. **No renegotiation**



Rails safeguard margin. Floor/cap balance customer upside with downside protection

Flows of Assets and Rights



REC Rights



Cash

Cons

Revenue fluctuates with REC prices (within floor/cap)



Portfolio **forecasting is more complex** than fixed fee models



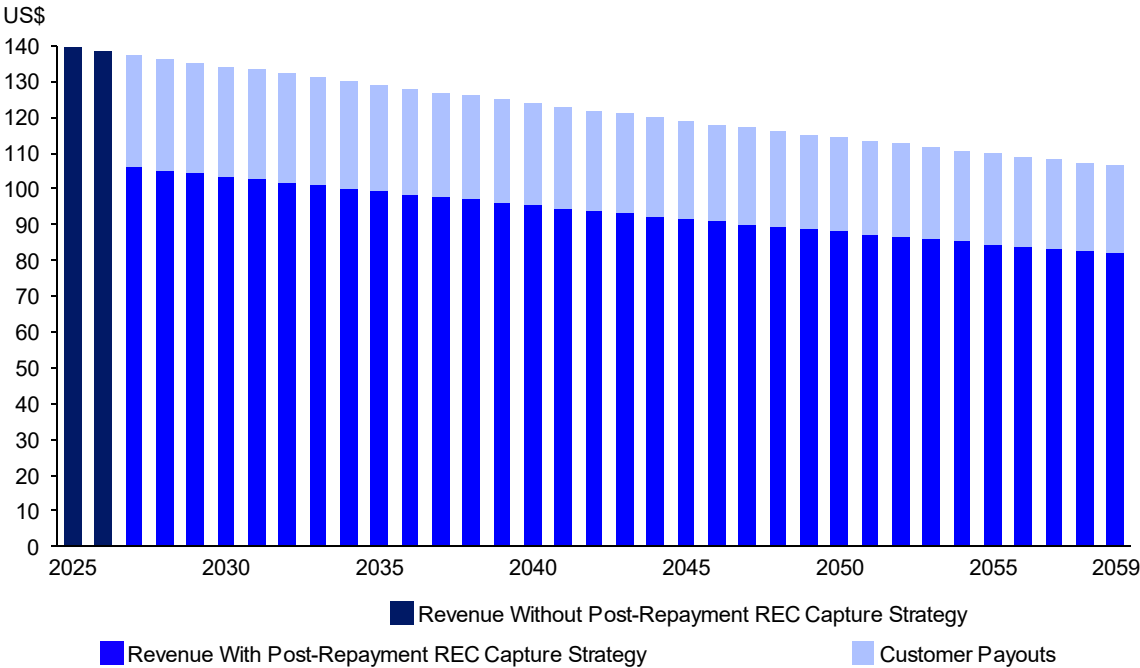
Communication of the min/max structure **must be clear**



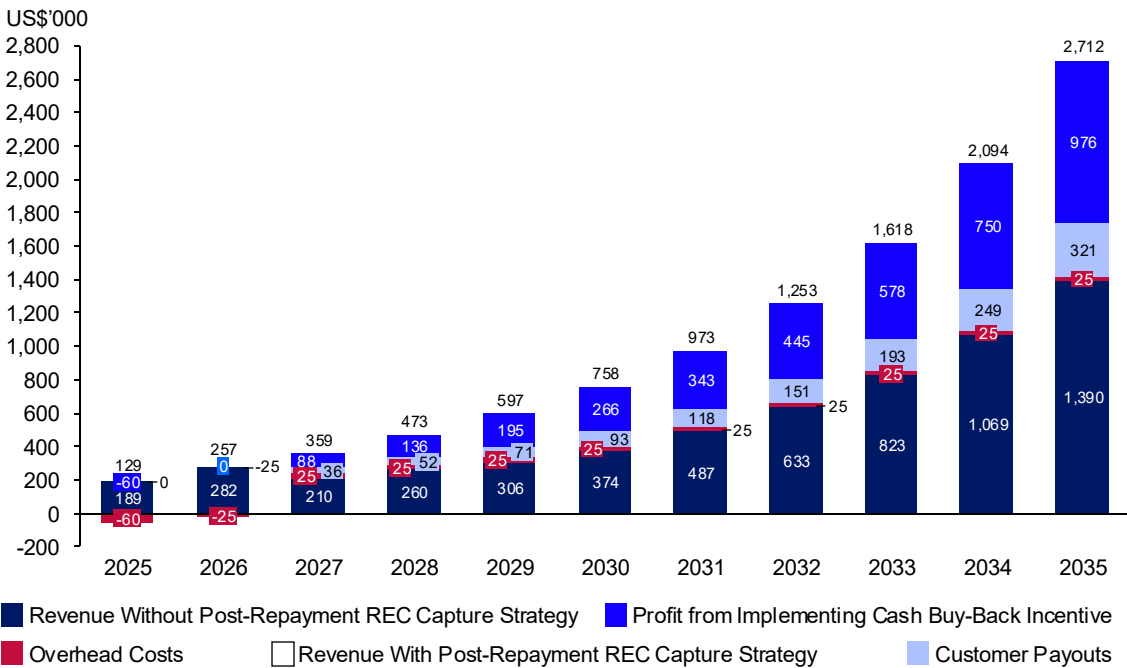
Cash Buy-Back: Share Value, Scale REC Monetization

Until 2035: +~\$3.7m Net to Stride and ~\$1.3m Paid to Customers

Average Rooftop System REC Revenue Over Panel Life



REC Portfolio Revenue Potential



Total REC Revenue	Stride	Customer
Current Model	~\$278 over a 2-year period	—
Post-repayment REC capture strategy (cash buy-back)	~\$3'359 over a 35-year period	~\$924 over a 33-year period

Until 2035,

- **Stride** would make an increase in profit of **\$3.5 – \$3.9 million**
- **Customers** would receive cash payouts of **\$1.2 – \$1.3 million**

by implementing the cash buy-back incentive option

Insurance: Fixed Cost, Full Price Upside

Mechanics at a Glance: Third-Party Insurance, Customer Protection, Channel Sales, Plus Benefits and Risks

Incentive Logic



Stride pays a **third-party insurer** a **fixed premium**: **\$3.89/REC** (range \$3.11 – \$4.66)



The insurer covers system risks. The customer gets **protection instead of cash**



Stride sells the RECs via Strategy 1 channels and **keeps the spread**

Pros



Fixed, **predictable cost** per REC

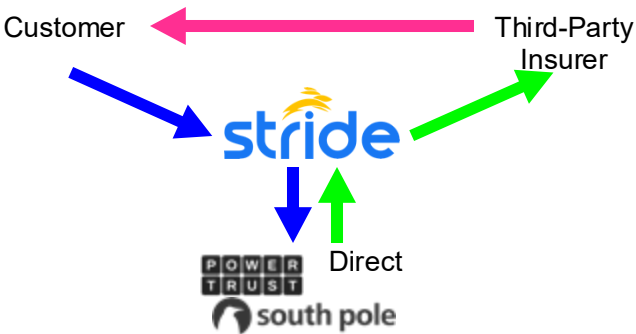


Full upside if REC prices rise (no % payout)



Simple to communicate: **“We pay your PV insurance.”**

Flows of Assets and Rights



REC Rights



Cash



In-Kind Service

Cons

Margin risk if REC prices fall near/below the premium level



Dependence on insurer performance and exclusions



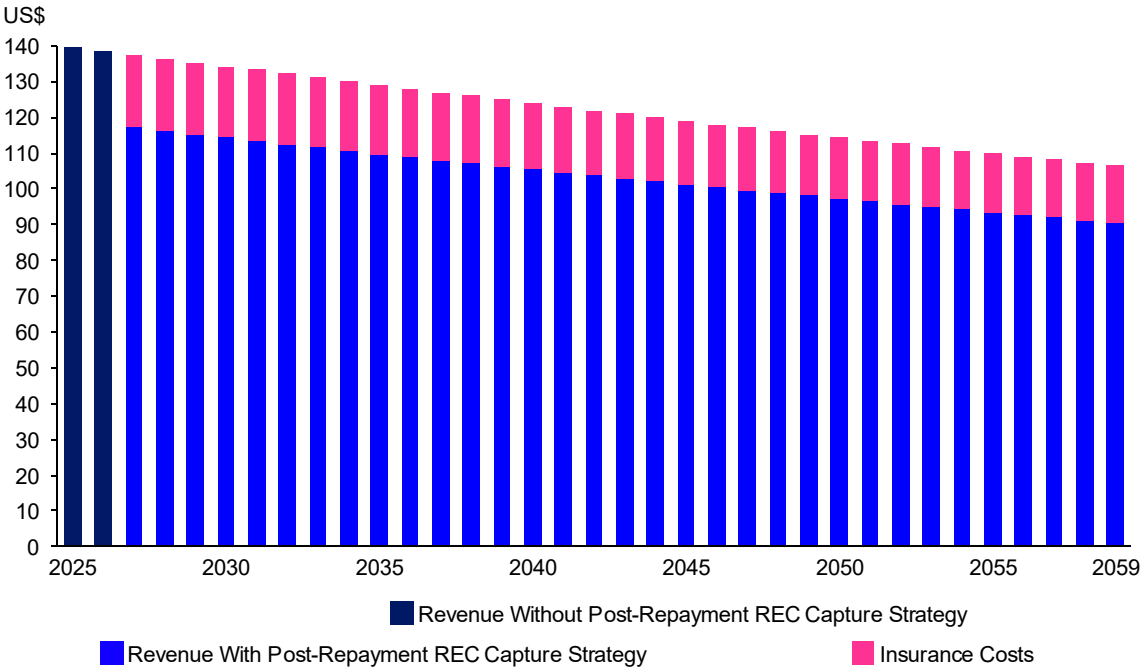
Communication of the scope (covered perils, deductibles, renewal cadence) **must be clear**



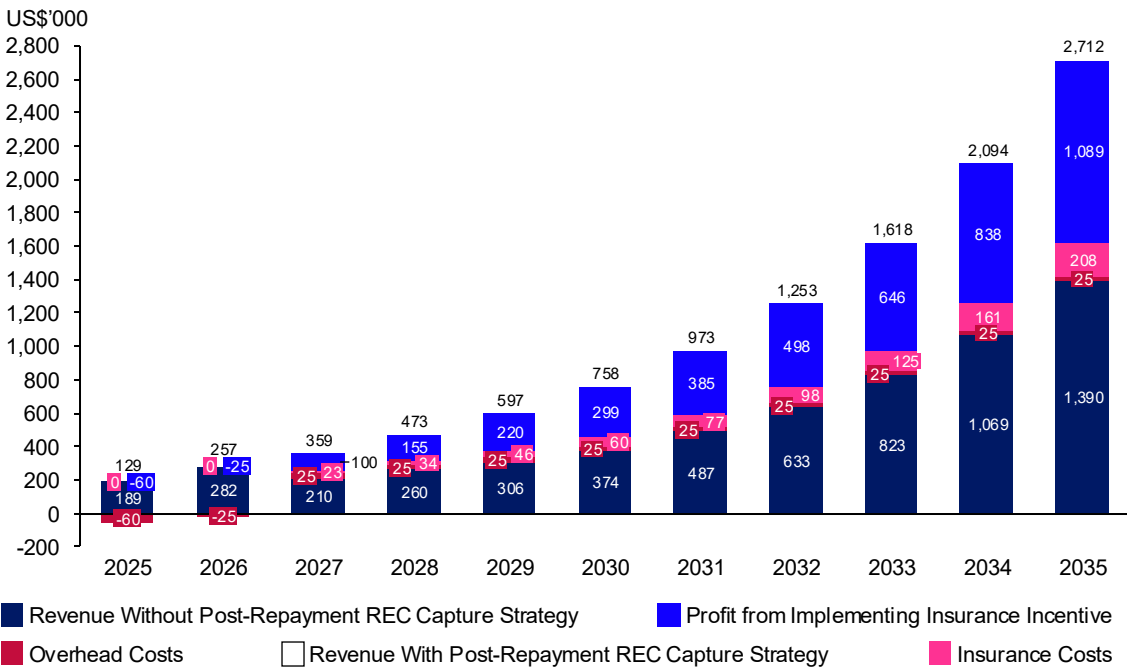
Insurance: Fixed Cost, Full Price Upside

Until 2035: +~\$4.1m Net to Stride and Free PV Insurance for Customers

Average Rooftop System REC Revenue Over Panel Life



REC Portfolio Revenue Potential



Benefits	Stride (REC Revenue)	Customer
Current Model	~\$278 over a 2-year period	—
Post-repayment REC capture strategy (insurance)	~\$3'684 over a 35-year period	Free PV insurance over a 33-year period

Until 2035,

- Stride would make an increase in profit of **\$3.9 – \$4.4 million**
- Customers would get **free insurance** of their PV systems

by implementing the insurance incentive option

Source(s): Stride operational data (Stride AIIF II IC 2024, p. 52-54), National University of Singapore et al. (2020, p. 69), own calculations (REC Revenue Excel Model) (see appendix for more details)

Notes: The insurance premiums per REC are based on the insurance cost of the project value (\$3.11 ~ 0.4% / \$3.89 ~ 0.5% / \$4.66 ~ 0.6%) / The values used for the variables are those given as "base case" in the appendix slides "Input Assumptions – REC Revenue Model" / Revenue is net to Stride

Maintenance: Stride's Service Concept

Remote-First, Warranty-Supported Maintenance Ensures High System Uptime with Minimal Field Operations



Intelligent Monitoring



- **Continuously tracks system performance** via automated inverter telemetry and fault-detection algorithms.
- **Identifies issues early**, enabling proactive intervention without waiting for customer reports.



Early detection prevents technical escalation and significantly lowers long-term service interventions.

Remote Technical Support



- **Processes all alerts and customer tickets** through a structured remote diagnostic workflow that resolves most issues without onsite visits.
- **Clear guidance and automated analysis** minimise technician mobilisation and keep operations lean.



Remote-first **operations scale efficiently** and keep **service workloads extremely low**.

Targeted On-Site Service



- **Deploys on-site repairs only** when a verified technical defect requires physical intervention (e.g. wire repairs, connector fixes, DC/AC corrections, safe restarts).
- **Limited but free visits** create a premium service experience with tightly controlled field effort.



High perceived value with **minimal actual field effort** due to strict remote pre-filtering.

Hardware Protection



- **Covers all essential technical failure risks**, including one full inverter replacement over the system lifetime and repair/replacement of key BOS components (fuses, connectors, relays, communication modules).
- **Mitigates major hardware risks** in a predictable way, keeping systems running without exposing Stride to unlimited replacement costs.



The **largest technical risk** (inverter failure) is **predictable and budgetable**, enabling strong customer trust with controlled exposure.

Output assurance



- **Annual performance reports** and a **major technical inspection** every ten years are complemented by a 15-year product warranty and a **25-year performance warranty** (80% output guarantee) on the modules.
- **Ensures stable long-term system performance** while limiting Stride's need for intensive on-site intervention and protecting REC revenues.



Sustained energy output protects both customer satisfaction and Stride's long-term REC revenue stream.

Maintenance Cost Breakdown

Significantly Lower O&M Costs Driven by Salary Gap and Strong EPC Warranties

Base Case

Cost Category	MIN	MAX	Best Guess
Administrator	0.14%	0.29%	0.19%
Cleaner	0.10%	0.20%	0.13%
Inverter Specialist	0.19%	0.39%	0.26%
Inspector	0.10%	0.20%	0.13%
Journeyman Electrician	0.04%	0.09%	0.06%
PV module / array specialist	0.03%	0.06%	0.04%
Network/IT	0.00%	0.00%	0.00%
Master Electrician	0.02%	0.04%	0.03%
Mechanic	0.02%	0.04%	0.03%
Pest Control	0.01%	0.01%	0.01%
Mower/Trimmer	0.06%	0.13%	0.09%
Total	0.69%	1.45%	0.95%

Cost Adjustments for Stride

Salary Differences	~60% of total PV O&M costs are labour-driven. - Vietnamese PV installer/electrician salaries are ~30% of peer-country levels. - Most categories are labour-intensive → structural downward pressure on Vietnam O&M costs.
Warranties already included by EPCs	Installation defects (~5%) fixed by EPC crews (5-year workmanship warranty). Inverters covered by 5-year product warranty → replacements handled by EPC/manufacturer. Preventive maintenance: EPC covers first 3 years, so Stride benefits from 1 year extra. Modules: 15-year product + 25-year performance warranty (80% output guarantee).
Rationale	- Labour discounting: 0.70 (salary gap) × 0.60 (labour share) ≈ 40% cost reduction on labour-driven items. - Inverter replacement not discounted (material-dominated + conservative approach). - Strong warranties + lower labour costs → materially lower Vietnam O&M vs. base case.

Adjusted Cost Breakdown

Cost Category	MIN	MAX	Best Guess
Administrator	0.08%	0.17%	0.11%
Cleaner	0.06%	0.12%	0.08%
Inverter Specialist	0.19%	0.39%	0.26%
Inspector	0.06%	0.12%	0.08%
Journeyman Electrician	0.02%	0.05%	0.04%
PV module / array specialist	0.02%	0.04%	0.02%
Network/IT	0.00%	0.00%	0.00%
Master Electrician	0.01%	0.02%	0.02%
Mechanic	0.02%	0.02%	0.02%
Pest Control	0.01%	0.01%	0.01%
Mower/Trimmer	0.04%	0.08%	0.05%
Total	0.50%	1.02%	0.69%

This model is highly adaptable because service scope can be adjusted through contract design e.g., offering or excluding the inverter replacement, limiting onsite visits, or tailoring component coverage. It also benefits from long standing relationships to contractors that are already in place from Strides core Business as well as economies of scale.

Maintenance: Keep Systems Running, Keep the Spread

In-Kind Service Valued at \$5.36/REC (\$3.89 – \$7.93)

Incentive Logic



Stride provides **break/fix maintenance** via partners: **valued at \$5.36/REC** (range: \$3.89 – \$7.93)



Stride coordinates EPC partners to deliver **remote-first support** and targeted **on-site repairs**



Stride sells the RECs via Strategy 1 channels and **keeps the spread**

Pros



Structural **labor advantage** in Vietnam materially **reduces long-term O&M cost** per system

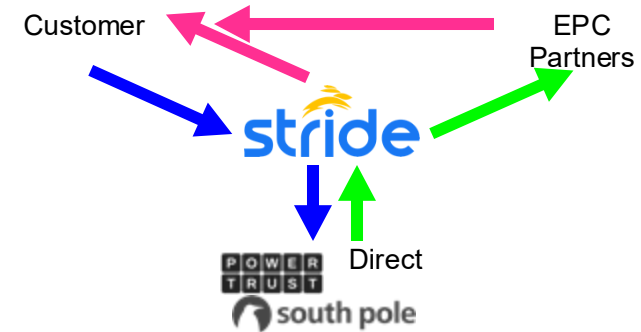


Strong EPC and manufacturer **warranties absorb most early-life hardware risk**



High and stable system performance **protects REC revenues** and strengthens customer satisfaction

Flows of Assets and Rights



REC Rights



Cash



In-Kind Service

Cons

Strong reliance on EPC and warranty execution. Delays or disputes can affect service quality



Repair volumes may exceed forecasts, making O&M **costs more volatile** than under fixed-fee models



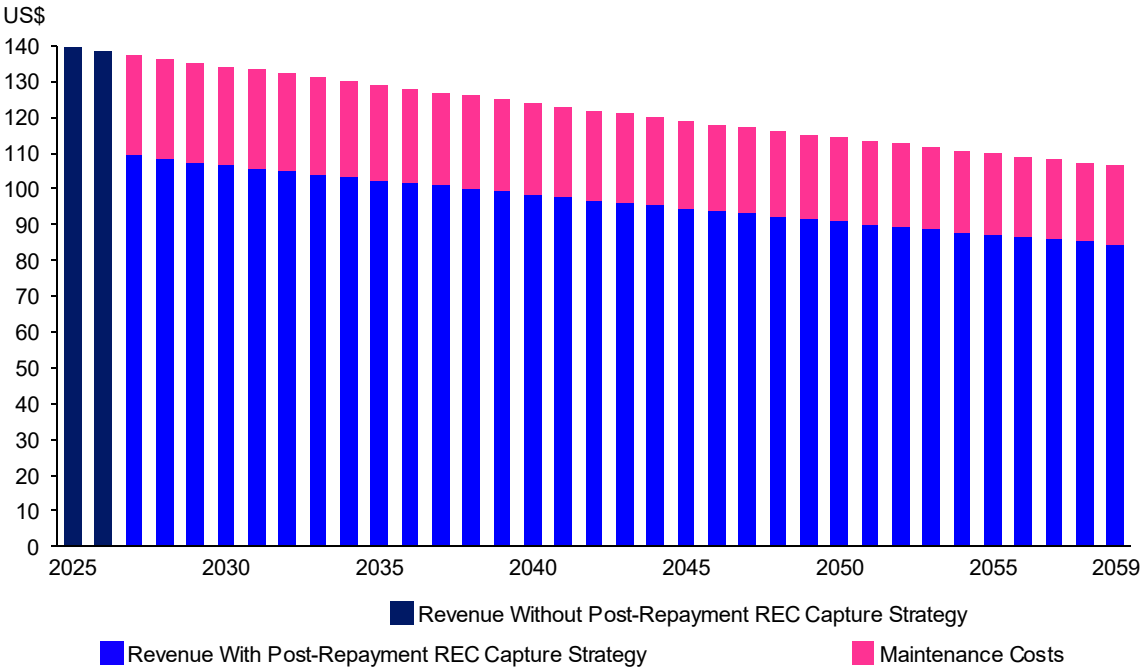
Higher operational workload than Buy-Back/Insurance, including customized contract setup and ongoing adjustments



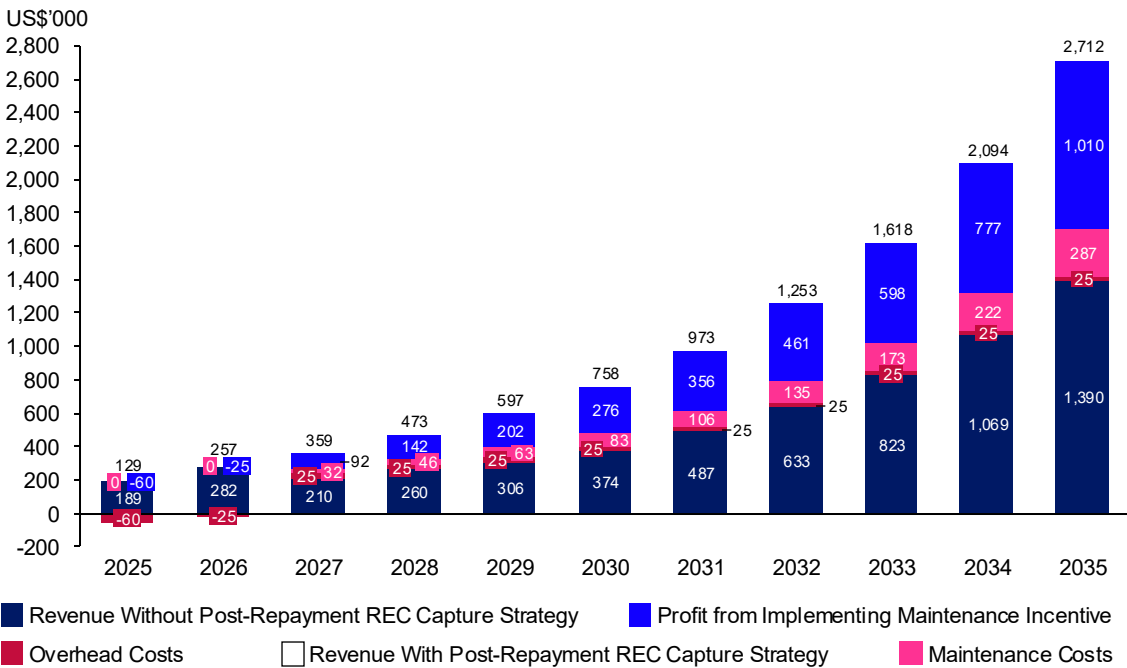
Maintenance: Keep Systems Running, Keep the Spread

Until 2035: +~\$3.8m Net to Stride and Free PV Maintenance for Customers

Average Rooftop System REC Revenue Over Panel Life



REC Portfolio Revenue Potential



Benefits	Stride (REC Revenue)	Customer
Current Model	~\$278 over a 2-year period	—
Post-repayment REC capture strategy (maintenance)	~\$3'457 over a 35-year period	Free PV maintenance over a 33-year period

Until 2035,

- Stride would make an increase in profit of **\$3.6 – \$4.0 million**
- Customers would get **free maintenance** of their PV systems

by implementing the maintenance incentive option

Source(s): Stride operational data (Stride AIIF II IC 2024, p. 39), Economic Research Institute (n.d.), Salaryexpert (n.d.), Liu (2021), National Renewable Energy Laboratory of the U.S. Department of Energy (2020), AL MATIN et al. (2019), own calculations

Notes: The maintenance premiums per REC are based on the maintenance cost relative to the project value (\$3.89 ~ 0.50% / \$5.36 ~ 0.69% / \$7.93 ~ 1.02%) / The values used for the variables are those given as "base case" in the appendix slides "Input Assumptions – REC Revenue Model" / Revenue is net to Stride

Summary — Which Incentive Wins When?

Cash Wins When REC Prices Are Low/Volatile; Insurance Wins When Prices Are Rising; Maintenance Wins When the Fleet is Large and EPC Is Reliable

Benefits per Option

	Beneficiary	Cash Buy-Back	Insurance	Maintenance
Per Average Rooftop System	Stride (lifetime – 35 years)	Revenue increase of ~\$3'000	Revenue increase of ~\$3'400	Revenue increase of ~\$3'100
Per Average Rooftop System	Customer (lifetime – 35 years)	Cash payouts of ~\$900	Free PV insurance	Free PV maintenance
Entire Portfolio	Stride (net – to 2035)	Increase in profit of \$3.5 – \$3.9 million	Increase in profit of \$3.9 – \$4.4 million	Increase in profit of \$3.6 – \$4.0 million

Scenario Fit & Rationale

Scenario	Usefulness Cash Buy-Back	Usefulness Insurance	Usefulness Maintenance	Rationale
Low & volatile REC prices	High	Low	Low	- Cash Buy-Back strongest → Stride pays 50% of a small REC value. - Insurance & Maintenance weak → Fixed premium or O&M costs outweigh low REC revenue.
Strongly rising REC prices	Medium	High	Medium-High	- Insurance best → Fixed cost + full upside capture for Stride. - Buy-Back expensive / Maintenance moderate → 50% share erodes margin; maintenance benefits but lags vs. insurance.
Higher technical failure rates / increased EPC risk	Medium	High	Low	- Insurance best → Stride is fully insulated from repair-cost volatility. - Maintenance worst / Buy-Back neutral → Maintenance absorbs higher O&M load; buy-back only hit by lower REC volume.
Large scaled portfolio (high REC volume)	Medium	Medium	High	- Maintenance strongest → Economies of scale (central workflows, EPC leverage, remote diagnostics). - Insurance & Buy-Back medium → both scale linearly, offering stable but non-improving margins at larger fleet sizes.

Conclusion



Continue with PowerTrust and Buy-Back RECs

Strategies Covering Short-Term and Long-Term Capacity at a Glance

Strategy 1: Buyer Profiles

Three suggestions



REDEX



D-REC Broker

Exchanges

DPPAs

Continue with PowerTrust as of now

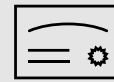
- Currently, stay with PowerTrust because of their premium prices (\$26) and minimal effort needed
- Excess RECs can be sold through REDEX – registration and sale all in one platform
- When MW capacity exceeds 1GW, DPPA is more favourable for long-term security

Strategy 3: Buy-back of RECs

Three suggestions



Cash Buy-Back



Insurance



Maintenance

Cash buy-back is best!

- Stride pays 50% of a small REC price
- Insurance is poor since fixed premiums may exceed revenue
- Maintenance is also weak because O&M costs become large relative to low REC income

Overall Timeline



Current MW Capacity
Continue with PowerTrust



Excess Unsold RECs
Sell on REDEX



MW Capacity = 1.75GW
Start processes on DPPAs, slowly shift from brokers and exchanges



MW Capacity = 3GW
Sell all RECs through DPPAs, negotiating higher prices due to impact projects

** All while buying back RECs from customers*

Conclusion

Two strategies encompass how Stride can leverage their current RECs, excess RECs, and future capacity – positioning Stride at a favourable position ensuring **ATTRACTIVE prices and LOW risk**





**And finally, a big thank you to
Cindy & Shaye!**
Any Questions?

Adrian Joachims
Adrien Paul
Jamie Kohchet-Chua
Satine Villard
Verlin You





Appendix

Sources & Interviews



Sources (1)

- Agopian, A. (2024, May 20). For Solar Developers – How Solar Property Insurance is Priced. Solar Insure. Retrieved November 17, 2025, from <https://www.solarinsure.com/for-solar-developers-how-solar-property-insurance-is-priced>
- AL MATIN, A., TAKEDA, S., TANAKA, Y., SAKURAI, S., & TEZUKA, T. (2019). LCOE Analysis for Grid-Connected PV Systems of Utility Scale Across Selected ASEAN Countries (ERIA-DP-2019-19). <https://www.eria.org/uploads/media/discussion-papers/LCOE-Analysis-For-Grid-Connected-PV-Systems-Of-Utility-Scale-Across-Selected-ASEAN-Countries.pdf>
- APERC. (2023, July). Renewable energy Certificates (RECs) in six APEC Southeast Asia economies. https://aperc.or.jp/file/2023/7/19/Renewable_Energy_Certificates-RECs-in_Six_APEC_Southeast_Asia_Economies.pdf
- Australian Government. (2025, November 3). Create small-scale technology certificates | Clean Energy Regulator. Australian Government - Clean Energy Regulator. Retrieved November 6, 2025, from <https://cer.gov.au/schemes/renewable-energy-target/small-scale-renewable-energy-scheme/small-scale-technology-certificates/create-small-scale-technology-certificates>
- CnerG. (n.d.). How I-RECs work: Issuing, Tracking, and redeeming - CNERG. <https://www.cnerg.net/resources/market-guides/how-i-rec-works>
- Cooke, R. (n.d.). Demystifying the D-REC: a new global standard for Distributed Renewable Energy. EnAccess. Retrieved November 22, 2025, from <https://enaccess.org/demystifying-the-d-rec-a-new-global-standard-for-distributed-renewable-energy/>
- DFDL. (2025, April 30). Vietnam Terms and Conditions 2024. Retrieved November 20, 2025, from <https://www.dfdl.com/locations/vietnam/terms-and-conditions/>
- Dogtiev, A. (2025, February 27). App development cost (2025). Business of Apps. Retrieved November 20, 2025, from <https://www.businessofapps.com/app-developers/research/app-development-cost/>
- D-REC. (2025, April 7). FAQ - D-REC. Retrieved November 22, 2025, from <https://drecs.org/faq/>
- EcoCart. (2024, March 4). How carbon credits are verified: The Carbon Credit Verification process. Retrieved November 22, 2025, from <https://ecocart.io/how-carbon-credits-are-verified/>
- ECOHZ. (n.d.). ECOHZ. Retrieved October 2, 2025, from <https://www.ecohz.com/sell-your-supply>
- Economic Research Institute. (n.d.). Installer Solar Energy System Salary. Eerier. Retrieved November 22, 2025, from <https://www.erieri.com/salary/job/installer-solar-energy-system/indonesia>
- Evident. (n.d.). Evident. Retrieved October 2, 2025, from <https://evident.app/>
- Global Market Insights. (2025). Renewable Energy Certificate (REC) Market Size - by capacity, by type, by source, analysis, share, & growth Forecast, 2025 - 2034 (No. GMI13693). Retrieved November 22, 2025, from <https://www.gminsights.com/industry-analysis/renewable-energy-certificate-market>
- Grand View Research. (n.d.). Voluntary Carbon Credit Market (2025-2030). Retrieved November 22, 2025, from <https://www.grandviewresearch.com/industry-analysis/voluntary-carbon-credit-market-report>
- GreenUP. (2024, May 17). How I-RECs are verified and tracked: A complete guide - GreenUp. GreenUp. <https://greenup.asia/i-recs-verification-tracking-guide/>
-

Sources (2)

Hamrick, K., Myers, K., & Soewito, A. (n.d.). Beyond Beneficiaries. In Fairer Carbon Market Frameworks. Retrieved November 22, 2025, from https://vcmintegrity.org/wp-content/uploads/2023/08/TNC_Beyond-Beneficiaries-030823.pdf

Heineken VN. (2023, October 19). Brewed with 100% renewable energy in Vietnam, Heineken® continues to create good times with consumers. Retrieved October 2, 2025, from <https://heineken-vietnam.com.vn/en/news-events/press-release/brewed-with-100-renewable-energy-in-vietnam-heineken-continues-to-create-good-times-with-consumers.html>

Hestiya. (2025, August 12). Vintage 2025 and Vintage 2024 I-RECs – Market Insights for H1. Retrieved November 22, 2025, from <https://www.hestiya.com/journal/vintage-2025-and-vintage-2024-i-recs-market-insights-for-h1>

International Carbon Action Partnership. (2025, July 2). Vietnam issues rules for pilot ETS, launching August 2025. Retrieved November 22, 2025, from <https://icapcarbonaction.com/en/news/vietnam-issues-rules-pilot-ets-launching-august-2025>

International Institute for the Unification of Private Law. (n.d.). Verified Carbon Credits. UNIDROIT. Retrieved November 22, 2025, from <https://www.unidroit.org/work-in-progress/verified-carbon-credits/>

I-TRACK. (2025, September 22). Issuers. Retrieved October 2, 2025, from <https://www.trackingstandard.org/issuers/>

Judge, P. (2023, April 4). D-RECs: Power investments that wire up the developing world. Retrieved November 22, 2025, from <https://www.datacenterdynamics.com/en/analysis/d-recs-power-investments-that-wire-up-the-developing-world/>

Kirmani, S., & Kalimullah, M. (2017). Degradation Analysis of a Rooftop Solar Photovoltaic System—A Case Study. ResearchGate, 217. <https://doi.org/10.4236/sgre.2017.86014>

Lei, L. (2024, February 28). Renewable energy certificates, defying criticism, take off in Southeast Asia. Eco-Business. <https://www.eco-business.com/news/renewable-energy-certificates-defying-criticism-take-off-in-southeast-asia/>

Liu, D. (2021, April 8). Rethinking solar operations with digital technology. Wood Mackenzie. Retrieved November 22, 2025, from <https://www.woodmac.com/news/opinion/rethinking-solar-operations-with-digital-technology>

MarketsandMarkets. (2025, April). Renewable Energy Certificate (REC) Market Report, 2025-2030. Retrieved November 22, 2025, from <https://www.marketsandmarkets.com/Market-Reports/renewable-energy-certificate-market-15096856.html>

McKinsey & Company. (2019). Exploring an alternative pathway for Vietnam's energy future. Retrieved October 5, 2025, from <https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Asia%20Pacific/Exploring%20an%20alternative%20pathway%20for%20Vietnams%20energy%20future/Exploring-an-alternative-pathway-for-Vietnams-energy-future-vF.pdf>

National Renewable Energy Laboratory of the U.S. Department of Energy. (2020). Model of Operation-and-Maintenance Costs for Photovoltaic Systems. Retrieved November 20, 2025, from <https://docs.nrel.gov/docs/fy20osti/74840.pdf>

National Renewable Energy Laboratory of the U.S. Department of Energy. (2023). Residential PV | Electricity | 2023 | ATB | NREL. Retrieved November 20, 2025, from https://atb.nrel.gov/electricity/2023/residential_pv

Sources (3)

- National University of Singapore, Consortium led by the Solar Energy Research Institute of Singapore (SERIS), & Reindl, T. (2020). UPDATE of the Solar Photovoltaic (PV) Roadmap for Singapore. <https://www.seris.nus.edu.sg/wp-content/uploads/2023/07/Update-of-the-Solar-Roadmap-for-Singapore-March-2020.pdf>
- Pangonilo, V. (2025, November 13). Technical note – Rooftop solar PV systems in the Philippines. Retrieved November 20, 2025, from <https://filipinoengineer.com/blog/2025/11/technical-note-rooftop-solar-pv-systems-in-the-philippines.html>
- Peh, G. (2025, June 2). Mapping coal phaseouts in key Asian markets. Institute for Energy Economics and Financial Analysis. Retrieved November 22, 2025, from <https://ieefa.org/resources/mapping-coal-phaseouts-key-asian-markets>
- Power Trust. (2025, June 10). Renewable Energy Procurement Platform - PowerTrust. PowerTrust. <https://powertrust.com/>
- Ritchie, H., Rosado, P., & Roser, M. (2020, June 10). Breakdown of carbon dioxide, methane, and nitrous oxide emissions by sector. Our World in Data. Retrieved November 22, 2025, from <https://ourworldindata.org/emissions-by-sector>
- Salaryexpert. (n.d.). IT Analyst Salary Ho Chi Minh City. Retrieved November 17, 2025, from <https://www.salaryexpert.com/salary/job/it-analyst/vietnam/ho-chi-minh-city>
- Science Based Targets initiative (SBTi). (n.d.). Science Based Targets. Science Based Targets Initiative. Retrieved November 22, 2025, from <https://sciencebasedtargets.org/about-us#what-we-do>
- ScottMadden Management Consultants. (2010). Solar Photovoltaic Plant Operating and Maintenance Costs. Retrieved November 22, 2025, from https://www.scottmadden.com/content/uploads/2024/01/ScottMadden_Solar_Photovoltaic_Plant_OM_Costs.pdf
- Sylvera. (2025, October 31). Carbon Offset Pricing Trends: What Buyers Should Budget for in 2025. Sylvera. Retrieved November 22, 2025, from <https://www.sylvera.com/blog/carbon-offset-price>
- Tan, C. (2024, September 1). ST Explains: What are transition credits and how can they help phase out the region's dirty coal? The Strait Times. Retrieved November 22, 2025, from <https://www.straitstimes.com/singapore/st-explains-what-are-transition-credits-and-how-can-they-help-phase-out-the-region-s-dirty-coal>
- Tan, R. (2024, August 15). Vietnamese I-REC prices hit record low, unredeemed figures rise to 1.32 Two. S&P Global. Retrieved November 22, 2025, from <https://www.spglobal.com/commodity-insights/en/news-research/latest-news/energy-transition/081524-vietnamese-i-rec-prices-hit-record-low-unredeemed-figures-rise-to-132-twh>
- Tan, R. (2025, January 16). Vietnam's I-REC market sees lower prices in 2024 amid supply glut. S&P Global. Retrieved November 22, 2025, from <https://www.spglobal.com/commodity-insights/en/news-research/latest-news/energy-transition/011625-vietnams-i-rec-market-sees-lower-prices-in-2024-amid-supply-glut>
- The Intergovernmental Panel on Climate Change. (2021, August 9). Sixth assessment report — IPCC. IPCC. Retrieved November 22, 2025, from <https://www.ipcc.ch/assessment-report/ar6/>
- The International Tracking Standard Foundation. (2025, November 14). Accredited Entities. I-TRACK. Retrieved November 22, 2025, from <https://www.trackingstandard.org/accredited-entities/>
-

Sources (4)

UN Environment Programme, Carlin, D., Li, W., Lorkowski, L., & Cheng, H.-Y. (2024). 2024 Climate Risk Landscape Report. Retrieved November 22, 2025, from <https://www.unepfi.org/wordpress/wp-content/uploads/2024/04/Climate-Risk-Landscape-2024.pdf>

US Department of Energy. (2016). Customer Acceptance, Retention, and Response to Time-Based Rates from the Consumer Behavior Studies. In Smart Grid Investment Grant Program (American Recovery and Reinvestment Act of 2009). Retrieved November 6, 2025, from https://www.energy.gov/sites/prod/files/2016/12/f34/CBS_Final_Program_Impact_Report_Draft_20161101_0.pdf

USAID, & Leisch, J. (2022). Renewable Energy Certificate (REC) Market in Vietnam. In USAID. Retrieved November 22, 2025, from https://vepg.vn/wp-content/uploads/2022/12/5.-EN_USAID-V-LEEP-II-REC-VEPG-Presentation_2022.11.25_Formatted.pdf

Van Der Merwe, M. (2022, October 6). D-RECS: Enabling new finance opportunities for Off-Grid energy access. Okra Solar. Retrieved November 22, 2025, from <https://www.okrasolar.com/blog/d-recs-enabling-new-finance-opportunities-for-off-grid-energy-access>

Vu Phong Energy Group. (2024, January 1). Overview of Renewable Energy Certificate (REC). Retrieved November 22, 2025, from <https://vuphong.com/certificate-rec/>

Vu Phong Energy Group JSC. (2024a, May 8). Overview of Renewable Energy Certificate (REC). Vu Phong Energy Group. <https://vuphong.com/certificate-rec/>

Vu Phong Energy Group JSC. (2024b, July 30). Trading Renewable Energy Certificates (I-RECs): Great potential for renewable energy projects. Vu Phong Energy Group. <https://vuphong.com/renewable-energy-certificates-i-recs/>

Wood MacKenzie. (2024, October 3). Renewable Energy Certificate (REC) prices to drop 76% by 2050 due to surging renewable generation in Asia Pacific. Wood MacKenzie. <https://www.woodmac.com/press-releases/rec-apac-2024/?utm>

XPanSiv. (2025, May 22). Renewable energy - XPanSiv. Xpansiv. <https://xpansiv.com/renewable-energy/>

Interviews

Interview with a sales and marketing coordinator, Vietnamese Company (Sep 2025, personal communication, interviewee requested anonymity)

Interview with Alex Chong, Head Researcher for Grid Development, NTU Research, (Nov 2025, personal communication)

Interview with Andrew Fairthorne, CEO, Stride (Sep 2025, personal communication)

Interview with Bénédicte Vignoboul, Directrice Valorisation / Power Sales, TSE (Nov 2025, personal communication)

Interview with Gaurav Julka, Director of Client Development, Climate Impact X (Sept 2025, personal communication)

Interview with GetSolar (Nov 2025, personal communication)

Interview with GoNetZero (Nov 2025, personal communication)

Interview with Jade Feinberg, industry professional with experience across multiple roles in the carbon markets/ESG sector (Nov 2025, personal communication)

Interview with Koiki Manning, student with experience in relevant companies in the renewable energy/REC industry (Nov 2025, personal communication)

Interview with Michael Yiin, industry professional with experience across multiple roles in the carbon markets/ESG sector (Nov 2025, personal communication)

Interview with Shreya Thomas, Business Development Executive, EMC (Sept 2025, personal communication)

Interview with Solartrix (Oct 2025, Singapore International Energy Week Event)

Interview with Tan Yu Yun, Senior Business Development Manager, Keppel Data Centers (Sept 2025, personal communication)

Interview with Yan Ya Lun, Investment Analyst, ESR (Sept 2025, personal communication)

Interview with Yuvaraj Dinesh, Business Development Lead, Infrablocks Technologies, (Nov 2025, AlterCop30)

Overall Decarbonisation Efforts



Overview of Global Climate Landscape

Call for Action on the Current Sustainability Problems and Government Goals

IPCC Assessment Report (Intergovernmental Panel on Climate Change) – Chapter 6

- Roadmap for transforming global energy systems to limit global warming – not mandatory for governments to follow
- A scientific report showcasing the implications of using non-renewable energy sources



Relevance to Article 6 of the Paris Agreement

- IPCC Report supports the Paris Agreement by providing scientific reports, turning this into a global policy and structure for governments across the world to follow
- Provides a framework for countries to cooperate on climate action, enabling them to use market-based and non-market-based mechanisms to achieve climate targets

Key Findings



Urgent shift away from fossil fuels → carbon budget is shrinking



Renewables are slowly becoming more affordable in long run → lifecycle and infrastructure changes can drastically change emissions



Integration of carbon capture storage, grids and clean fuels is essential → needed to reach global net zero by 2050



Article 6.2
Provide accounting & reporting guidance for countries to use international carbon instruments through bilateral or multilateral agreements



Article 6.4
Establishes a new UN Framework Convention on Climate Change (UNFCCC) mechanism which can be used to trade CCs



Article 6.8
Provide opportunities for non-market-based cooperation for enhancing climate action

Relevance to the Project

Governments worldwide are called to invest more into renewable projects due to the increasing effects of climate change with Article 6 of the Paris Agreement requires countries to have structured plans regarding sustainability. Understanding this relevance provides clarity on why carbon instruments have been growing over the past few years and why it is a growing space with plenty of profitable opportunities.

Relevance to Science-Based Targets Initiative (SBTi)

The SBTi includes science-based targets that show companies and financial institutions how much and how quickly they need to reduce their greenhouse gas (GHG) emissions to prevent the worst effects of climate change

It defines:

- Best practices in emissions reductions and net-zero targets
- Standards and tools to help companies align with climate science goals



UN Environment Programme

- Regulatory environment developments worldwide are focused on global standardisation and alignment of climate-related disclosure frameworks – providing incentives for businesses to include sustainability reports that are recognised worldwide
- More sustainability efforts are required to be reported in countries such as UK, SG, Brazil, etc.

Key Findings



Preference of Geographic Relevance

Buyer close to the supplier can reap more benefits, including the actual electricity



Importance of Temporal Relevance

REC should match the time period during which the company consumed the electricity



Climate Action Gap

Global emissions must fall at a faster rate to limit global warming to 1.5°C



Effects on Vulnerable Population

Climate change, biodiversity loss, and waste pollution have all been increasing and affecting vulnerable populations



Increase in Financial Support

Achieving climate goals must require an increase in financial support from governments and private firms

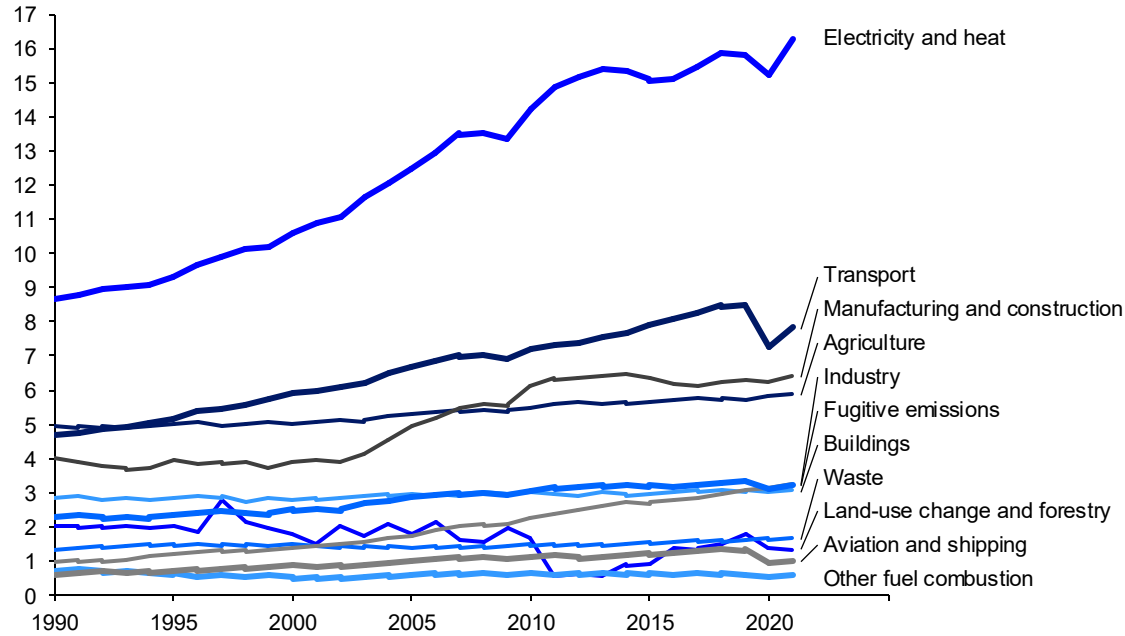
Relevance to the Project

Preferences for geographic and temporal relevance can guide carbon instrument buyers to make more suitable decisions while contributing to achieving climate change goals to benefit vulnerable populations, such as ethnic and racial minorities.

Overview of Global Climate Landscape

Current Energy Landscape and Initiatives

Greenhouse Gas Emissions by Sector¹



Interpretation

Electricity and heat contribute the most to GHG in the world. This can be due to the following industries:

- Industrial (manufacturing, construction, mining, processing)
- Households
- Services (commercial buildings, transport, public utilities)
- Agriculture (forestry operations, fisheries, crop farming)

Global Developments on Sustainable Energy Sources



Natural Gas



Cleanest fossil fuel that produces the least amount of carbon emissions, however, still releases GHG.



Solar



Solar energy is dependent on solar panels, which require more land space.



Wind



Natural source not producing GHG gases, reliant on kinetic energy located on land and in water.



Hydropower



Popular in China, producing 50% of the world's hydroelectricity due to the large river system across the country.



Regional Power Grids



Import green energy from regional countries with the abundance of renewable sources, improving with the ASEAN Power Grid



Solar



R&D on hydrogen, geothermal, nuclear, carbon capture, and storage.

3 Scopes of Emissions

Different Types of Emissions, Different Carbon Instruments

	Scope 1	Scope 2	Scope 3
Type of Emissions	Direct	Indirect	Indirect
Phase of Production Cycle	During Production	Upstream	Upstream & Downstream
Activities	Manufacturing, Direct Services	Off-site energy (electricity, heating, cooling) when a company makes a purchase from a 3 rd party	Activities prior to production / disposal of products or services
Estimated Share Worldwide	5-20%	5-20%	60%-90%
Examples	Fuel combustion in company owned vehicles, boilers, furnaces	Emissions from off-site power plants generating electricity for the company	Transportation, leased assets, distribution, processing of sold products
Mandatory to Report Worldwide?	Dependent on national regulations – encouraged to report all except Scope 3		
Common Carbon Instrument	Carbon Credits	RECs	Carbon Credits



**Relevance
Worldwide**

Universally recognized and **most consistently reported across multiple countries**, including the EU, the USA, and SG

Typically, mandatory for large corporations listed under GHG programs in home countries (e.g., countries filing for SG carbon tax)

Relevant to report for countries with **grid carbonization policies** and **renewable energy markets**

For instance, Malaysia and Hong Kong require corporations to disclose ESG efforts but do not specifically mention Scope 2 emissions

Least consistently reported due to **difficulty tracking before and after** production of the product or service

Nevertheless, **increasing need to disclose a range of emissions consumed** due to investor and regulatory pressure

Sustainability Instruments for the 3 Scopes of Emissions

Carbon Instruments Are Market-Based Tools Used to Measure, Price, or Trade Greenhouse Gas (GHG) Emissions

Instruments	Instrument Types	Purpose	Description	Market Type
Carbon Pricing Instruments (Scope 1,2,3)	Carbon taxes, Emissions Trading Systems (ETS)	Put a direct or market-based price on carbon	Carbon Tax: A fixed price per ton of CO ₂ e emitted. Firms pay for their emissions directly. ETS / Cap-and-Trade: Government sets a cap on total emissions and issues tradable allowances. Companies can buy/sell allowances.	Compliance
Carbon Credit Instruments (Scope 1, 3)	Carbon offsets (Verified Carbon Credit), removal credits, transition credits	Reward emission reductions or removals via verified projects	Carbon Offsets: 1 carbon credit = 1 tonne of CO ₂ reduced or avoided Carbon Removal: Credits issued for actively removing CO ₂ (reforestation etc.) Transition: Credits for emission reductions in hard-to-abate sectors; Recognize transitional improvements	Voluntary/ Compliance
Energy Attribute Certificates (Scope 2)	Renewable Energy Certificates (RECs, I-RECs, D-RECs, TIGRs)	Track and verify renewable electricity generation	Each REC represents 1 MWh of renewable electricity generated and fed into the grid.	Voluntary/ Compliance
International Mechanisms (Scope 1,3)	ITMOs (Article 6.2), Article 6.4 credits	Facilitate cross-border carbon trading under the Paris Agreement to meet NDC	Bilateral agreements: A <i>mitigation outcome</i> * transferred between countries (can be carbon or non-carbon) *Actual emission reduction or removal	Compliance
Hybrid/Emerging Instruments (Scope 1,2,3)	Transition credits, climate performance credits, Tokenized	Support partial decarbonization or verified reductions in hard-to-abate sectors / Make trading more transparent	Transition Credit: Early retirement of a coal-fired power plant and replacing it with lower-emission gas or solar etc. Tokenized Credit: Blockchain-based version of carbon/RECs	Emerging Voluntary

Sustainable Instruments Relevant to Stride

Carbon Instruments Are Market-Based Tools Used to Measure, Price, or Trade Greenhouse Gas (GHG) Emissions

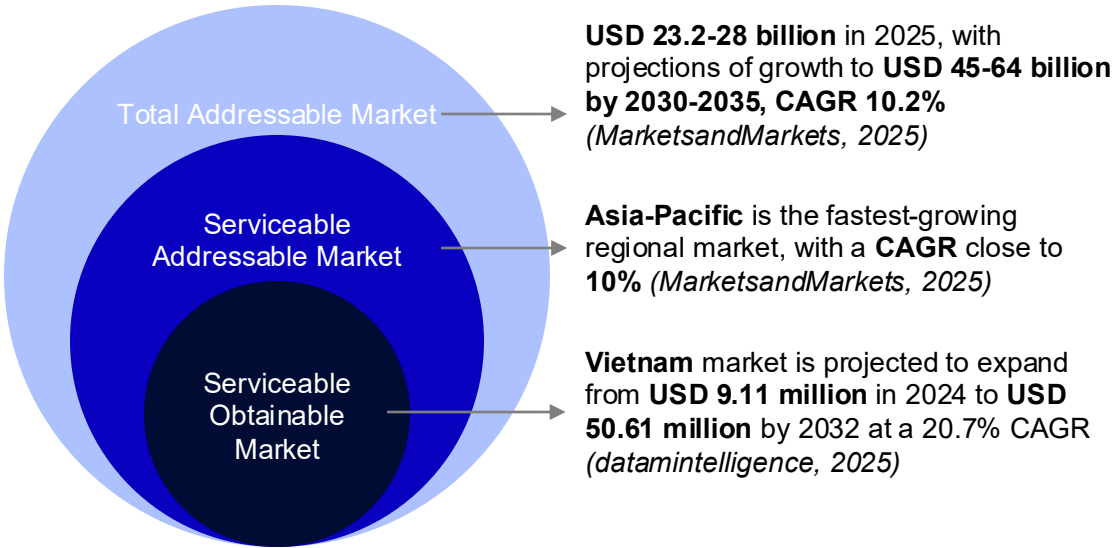
Energy Attribute Certificate (EAC) - RECs, I-RECs, D-RECs, TIGRs, GOs

To reduce market-based Scope 2 emissions, a company can procure EACs and retire them

RECs	Common in US, Canada, and Australia. Most widely traded EAC globally
GOs	Used in Europe
I-REC	Standardized for use in developing markets across Asia, Latin America, Africa, and the Middle East where they are no domestic system

They serve the same purpose, but are named differently due to **different regulatory frameworks, tracking systems, and standardization** in their respective regions.

→ RECs' average prices differ from regions, projects, and markets



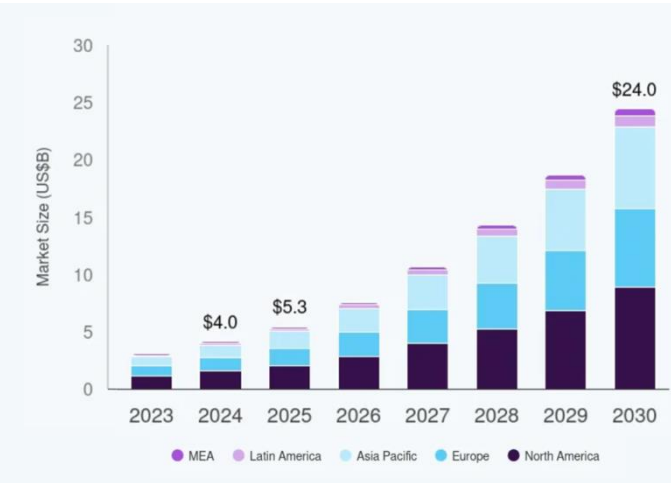
Carbon Credit Instruments

Verified Carbon Credits (VCCs)

- Each credit is uniquely numbered and recorded in a public registry for transparency, certified by standards like Verra/Gold Standard
- Satisfy only Scope 1 and 3 renewable electricity requirements
- Not applicable for companies participating in RE100
- Strict additionality requirements

Global Voluntary Market

- Market Size (2025): USD 5.32 billion
- Growth Rate: Projected CAGR of 35.1% (2025–2030), reaching nearly USD 24 billion by 2030
- Fastest Growing Market: Asia Pacific
- Price Range: USD 0.25 - 30 per ton, average USD 6.5



VCC is a **good complement but not a replacement for REC**. Providing both VCCs and RECs could be part of a mid- to long-term plan if Stride is exploring larger projects. However, it is **currently unfavourable due to high MRV costs and low per-project CO2**.

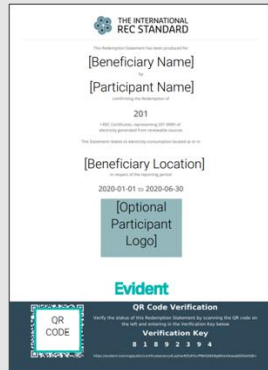
Role of RECs in Decarbonisation Efforts



Overview of RECs Globally and in Vietnam

Definition, Characteristics, Types, and Benefits of RECs

Definition & Characteristics of RECs



Renewable Energy
Certificates, which
focus on Scope 2
emissions:

- Digital assets validating renewable electricity to offset non-renewable electricity consumption



Unique

Each REC comes
with a unique
serial number



Tradable

Companies can
buy and sell
RECs for profit



Vintage

The year the REC
was created, with
older RECs being
less favoured



Tangible

A certificate
showing evidence
that the REC was
produced through
renewables



Financially- Motivating

Companies can
sell these RECs
at market price

Motivations to Procure/Generate RECs

- Corporate sustainability commitments
- Regulatory requirements
- Green building standards
- Government support
- Government incentives
- Sustainable investments
- Additional profits

1 REC = 1MWh

Types of RECs

1

Bundled RECs

Certificate with the
physical electricity
transferred via
subsea cables

2

Unbundled RECs

REC certificates
without the
physical electricity

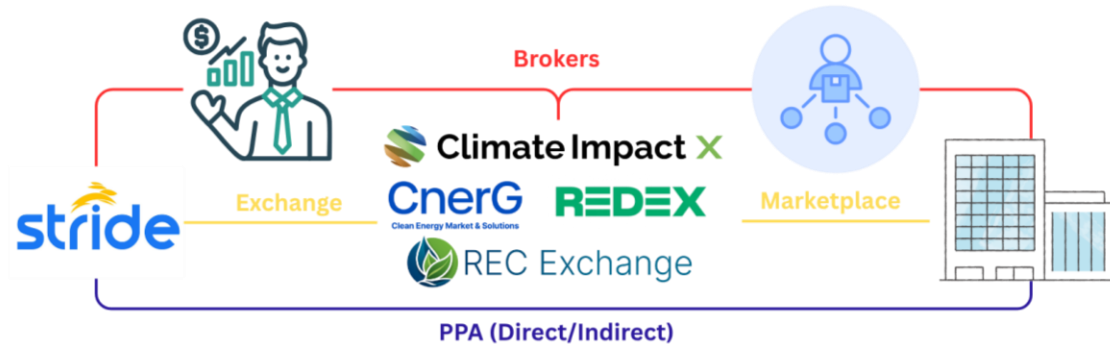
Contribution to Emissions

- **Market signal:** RECs create demand for renewable energy, which **incentivises further investment** and development of **clean power projects**
- They allow companies to **offset their Scope 2 emissions** (from purchased electricity), showing **progress toward net-zero** or renewable energy targets
- As **renewable generation increases through REC-driven demand**, it gradually displaces fossil fuel-based electricity on the grid, lowering overall greenhouse gas emissions

Three Main Channels of Sales for RECs

Less Intermediaries = More Margin

To get higher margin, more effort is needed to remove intermediaries



Different Types of Transactions

1. Seller > Broker > Marketplace > Broker > Buyer [for large or cross-border deals]
2. Seller > Broker(s) > Buyer [for tailored/negotiated deals, small sellers, big buyers]
3. Seller > Marketplace > Buyer [for standard RECs, easy process, fast deals]
4. Seller > Buyer [large multinational buyers and sellers, long-term deal]

Direct Power Purchase Agreement

Seller & buyer negotiate directly; either bundled with energy delivery or it's financial contract-for-differences (unbundled)

Best for: Large producers seeking maximum revenue

- 😊 Highest margin, full control over terms and buyer, long-term revenue certainty
- 😞 Significant sales effort, time-consuming, complex (negotiation, network & management expertise)

● Sales Effort ● Margin
● Buyer Access ● Control

Brokers (Seller/Buyer) (Virtual PPA)

Either **one or two brokers in the deal to match buyers & sellers**, handling admin/reporting work

Best for: Smaller producers / New market entrants seeking minimal operational burden

- 😊 Low operational effort, wider market access, pooled RECs
- 😞 Reduced margin, less transparency on prices/buyer profiles, strong dependency

● Sales Effort ● Margin
● Buyer Access ● Control

Exchange (Climate Impact X) (Virtual PPA)

Sellers registering & reporting RECs independently and listing them on the platform, fees only incurred when a deal is formed

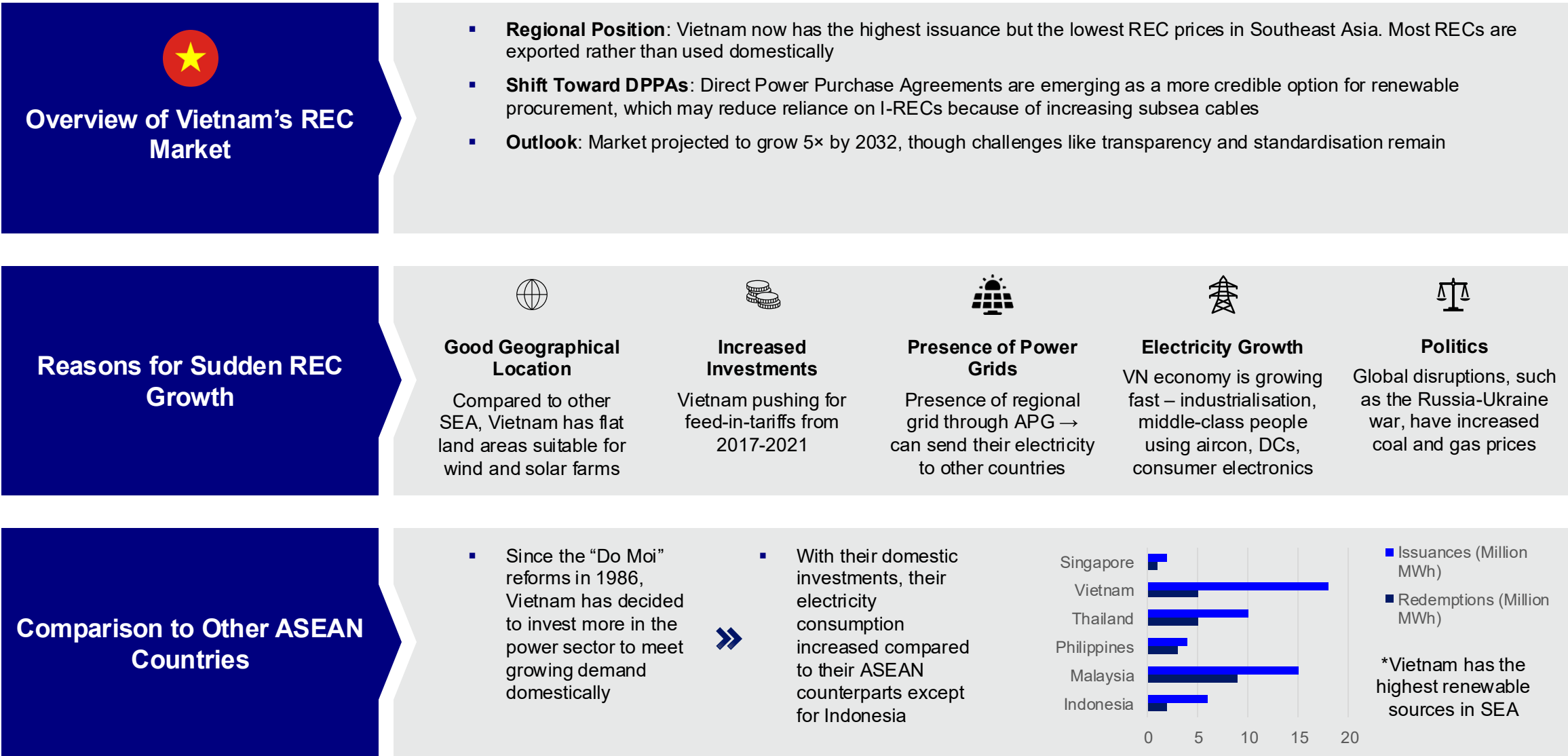
Best for: General RECs, transparency, and fast trades

- 😊 Fastest deals, simplified compliance (standard process), transparent prices, wide market access
- 😞 Platform fee, Commoditized RECs lowering premium for high-impact project,

● Sales Effort ● Margin
● Buyer Access ● Control

Overview of RECs in ASEAN and Vietnam

Vietnam REC Landscape and Comparison with ASEAN Countries



REC Key Players and Market Processes



Specialized Actors Connect Renewable Projects with Demand

Issuers, Registries, Intermediaries, and Buyers Sustain the REC Market in Vietnam

Solar Panel Fund Platforms

- **Stride**
- **Solarvest Holdings** – recently launched a solar financing program, Powervest
- **GreenYellow** – finance, design, construct, and operate solar energy systems in VN

Buyers / End Users

- Heineken Vietnam – confirmed I-REC buyer
- Multinationals – global REC users in VN and Worldwide
- Local corporates & banks – **ESG focus, rising REC demand**

Verifiers / Issuers

- **GCC** – **official I-REC issuer** in Vietnam
- APX (TIGR) – issues TIGRs, an alternative to I-RECs, but with a smaller market presence
- Independent auditors – verify generation data

Trading Platforms

- **Xpansiv CBL** – **largest global REC exchange**
- T-RECs.ai / GoNetZero – Asia & regional platforms
- **OTC deals** – direct to corporates or via brokers

Registries

- **Evident (I-REC)** – **main global registry** used in Vietnam
- APX TIGR Registry – alternative registry system

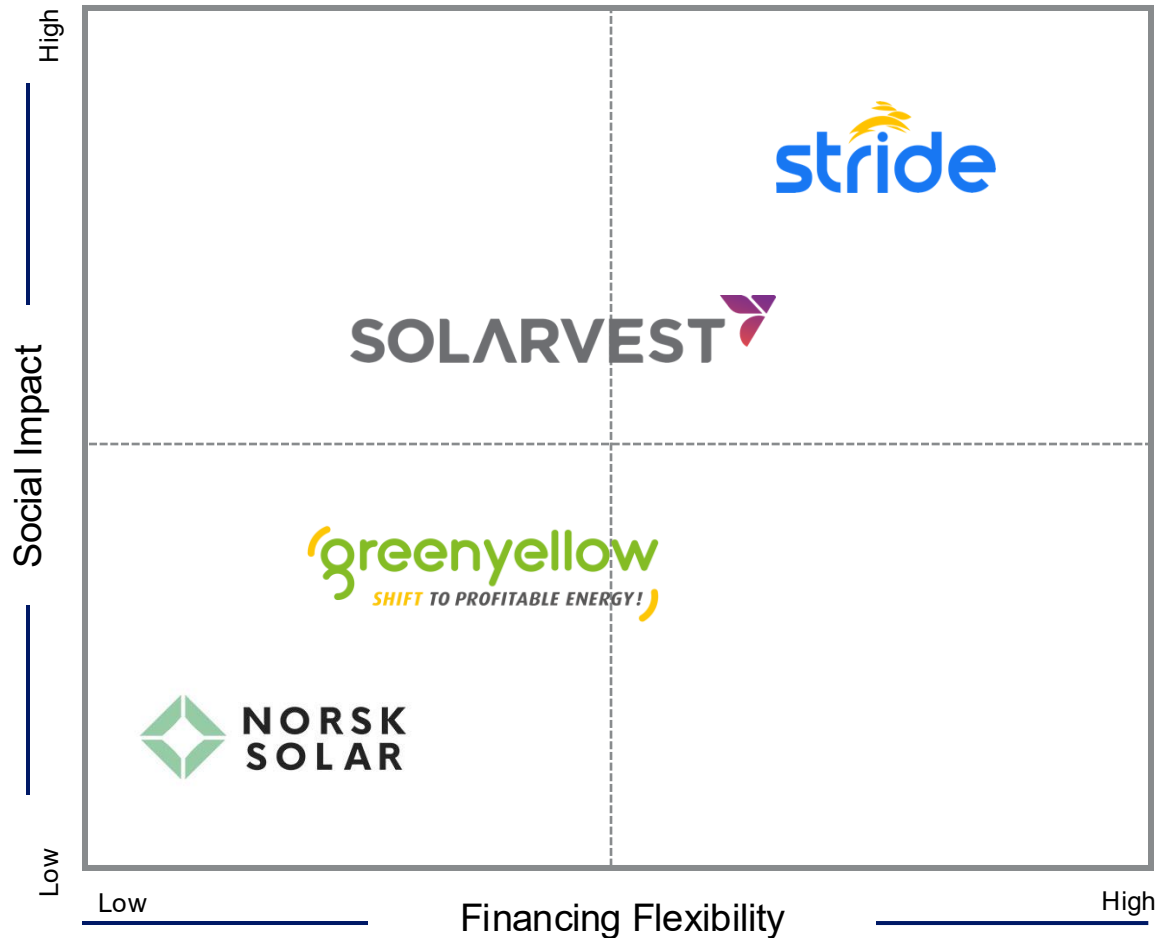
Aggregators / Service Providers

- VP Carbon, ECOHZ, South Pole – **aggregators & advisors** linking projects with buyers
- **PowerTrust** – bundles community RECs, offers impact-focused advisory
- Local consultants



Solar Panel Financing Platforms

Understanding the Competitive Landscape of Stride



Competitor Analysis

Company	Short Description
Stride	Primary Customer: Households in Rural Areas Financial Model: 80% paid by Stride, 20% upfront by customer Pros: Unique target audience, great costing, opportunities for D-RECs
SolarVest	Primary Customer: SMEs, Commercial, Industrial Financial Model: 50% paid by SolarVest, 50% upfront by customer Pros: Offers flexible payments mostly for B2B
GreenYellow	Primary Customer: Large Commercial, Industrial Financial Model: 100% loan paid by GreenYellow Pros: Handling financing, operations, and maintenance of the solar panels
Norsk Solar	Primary Customer: Commercial, Industrial, Retail Chains Financial Model: 100% loan paid by Norsk Solar financed through debt+equity Pros: Strong finances and reliable returns

Relevance to the Project

Stride is uniquely positioned well against their competitors, with pros including a higher REC pricing due to more impactful contributions to rural areas, highly demanded by MNCs.

REC Registries and Issuers

REC Standards & Compliance Worldwide and Vietnam

Registry (I-REC or TIGR Standards)

Depending on country, and seller preference, to pick **ONE** registry



By I-TRACK Foundation in Europe¹

Manages RECs in **60 countries**, with most issuances in China, Brazil, and Turkey



By APX in the USA

Newer standard often used due to digital ease, **tech-integrated, real-time tracking**



Local Issuer for I-REC

Dependent on country

Countries typically assign national electricity bodies to issuer RECs
(e.g. SP Group for SG, The Green Certificate Company for VN)

Local Issuer for TIGR

APX

Digital platform that requires companies to register all through one site - easier for companies, however still developing mainly in SEA

Companies that register can choose REC Standard to follow; else, will be determined by broker or exchange

Global REC Market

I-REC & TIGR

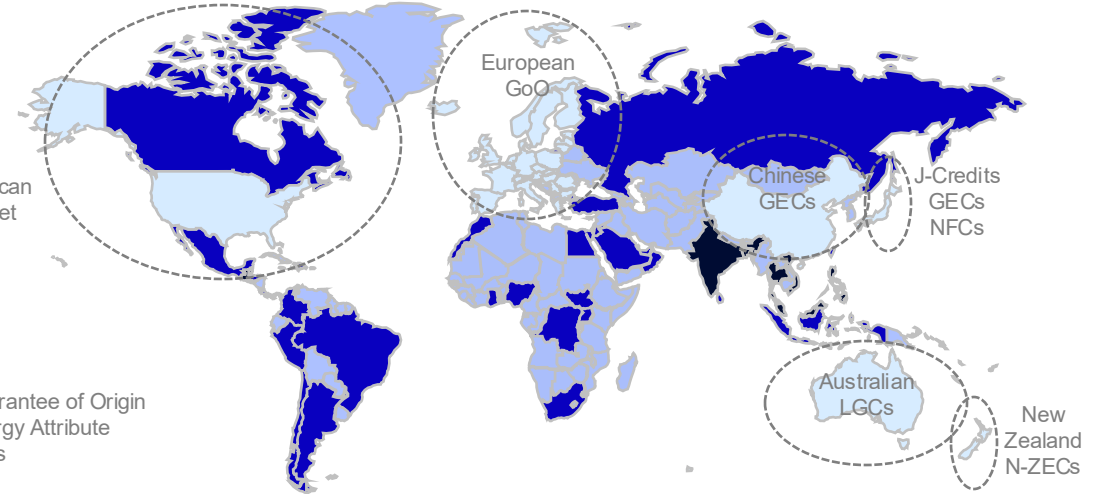
I-REC

National and/or Regional scheme

EACs currently not available

North American REC Market

GoO: Guarantee of Origin
EAC: Energy Attribute Certificates



Vietnam REC Market



120 projects registered in Vietnam

- 80 Hydropower
- 26 Solar Projects
- 4 Wind
- More than 3,085 MW installed capacity



46 projects registered in Vietnam

- 14 Solar Photovoltaic Projects
- 31 Solar Serving On-Site Load
- 1 Wind
- More than 307 MW installed capacity

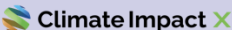


Recognized by organizations incl. the GHG Protocol, RE 100 and CDP

REC Trading Platforms and Other Key Players

REC Registration Processes in Vietnam and Trading Platforms

Trading Platforms for RECs

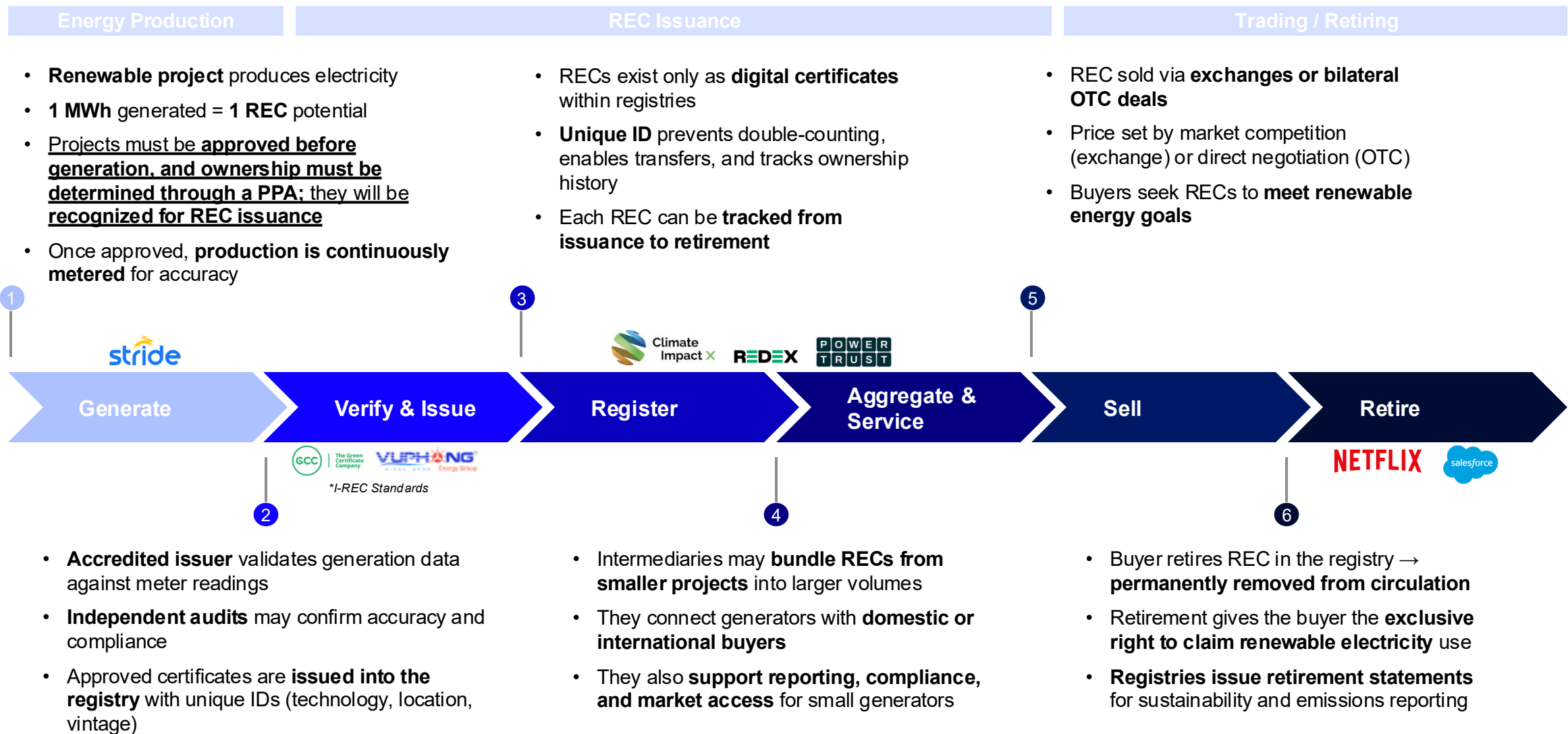
Key Features	In Vietnam	Key trading platforms / marketplaces that are accessible in Vietnam:	
 Asia-wide REC marketplace with registry integration	Frequently used by corporates across the region		
 Frequently used by corporates across the region	Operational in Vietnam with multiple trades from VN to SG	Allows companies to purchase and sell RECs to and from Vietnam – mediating the best prices for sellers and best contract terms for buyers	
 Full-cycle digital platform from issuance to retirement	Fully scalable and global, accessible from Vietnam	*More popular with smaller REC producers without enough capacity to sign a DPPA	
		If companies do not want to go to these platforms directly and want to, register RECs they should go to service providers like VP Carbon, Vu Phong Energy Group, etc.	

Other Key Players in Vietnam

Official Issuer (GCC)	Service Providers	End Buyers
- In Vietnam, the accredited I-REC issuer is the Green Certificate Company (GCC). - GCC is appointed by the International Tracking Standard Foundation (I-REC Standard). Their role is neutral and administrative: - Register renewable energy projects in the I-REC registry. - Verify generation data. - Issue official I-REC certificates (1 MWh = 1 REC). - Ensure no double-counting or fraud.	- Vu Phong Energy Group is not an issuer. They are a local partner / service provider. - Their role is commercial and operational: - Help renewable energy project owners (e.g., solar farms, wind farms) apply for I-REC registration through GCC. - Provide consulting, documentation support, and ongoing management. - Sometimes act as brokers — connecting project owners (sellers of RECs) with corporates (buyers who need RECs for sustainability targets)	- Although not mandatory for RECs to be purchased and reported, many multinational corporations are purchasing RECs to report on their annual statements - Unlocks future incentives such as green financing investments, ESG government advantages, especially in tech, etc. - Examples: Unilever, Netflix, Amazon Web Services

Structured REC Lifecycle Ensures Credible Renewable Claims

Verification, Registry Tracking, and Controlled Retirement Guarantee Traceable, Tradable Certificates for Reliable Corporate Reporting



Current Developments on REC Standards Worldwide

Global Climate and Energy Landscape

Current Standards for International Trade

Southeast Asia does NOT have a standard to guide the buying and selling of RECs – can only package as Asian RECs, but not able to sell directly to another country

Local guidelines in nearby countries make it difficult for RECs to be recognized cross-border

For instance, SG has the SS 673 which standardizes the trade of RECs in the country

International RECs are usually traded within international marketplaces such as TIGR (subject to whether REC standards are recognized in the buyer's country)

Recent Developments

The I-TRACK Foundation to support development of cross-border REC framework for Southeast Asia

Regional Frameworks for Cross-Border Renewable Energy Certificates (RECs) Trading on Grid-to-Grid Transmission Lines: Gap Analysis vis-à-vis International Standards



Singapore seeks experts to work on global framework for cross-border renewable energy certificates

Summary

- With the APG, there are more calls for a standardized buying and selling of RECs in Asia
- SG is collaborating with Malaysia to build a new REC framework for bilateral trade to standardize code of practices, ensure proper verification, support REC market development, and integrate with power grids for physical electricity trade in SEA
- Prevent greenwashing in cross-border trade, especially in SEA, with an increase in REC supply
- Provide government oversight over the trading of RECs, making it more credible

However, proven to be challenging because of:

- Potential to mix renewable and non-renewable energy sources in the local grid
- Different financial constraints cross-border

Relevance to the Project

The future framework in SEA provides additional standards and guidelines for the efficient trading of RECs. Once the framework is finalized, there will be a surge in REC demand as companies recognize RECs' credibility.

Overview of D-REC Initiative



Overview of D-RECs

Distributed Renewable Energy Certificate Worldwide and Vietnam

What is a D-REC?



- Distributed Renewable Energy Certificate
- 1 MWh of renewable electricity
- Small-scale, distributed energy systems



Unlock new climate finance and accelerate the adoption of DRE, creating measurable climate and social impact in underserved communities.

D-RECs Initiative

- D-RECs = High-impact verification label for EACs, issued as a type of I-RECs, from DRE projects
- Launched in 2021 by **South Pole & Positive. Capital Partners**
- To address the lack of access to clean energy in emerging markets



Distributed Renewable Energy (DRE) Projects

Small-scale, decentralized renewable energy systems (such as rooftop solar, village mini-grids, biomass, and wind) that generate power close to where it is used – often in off-grid or remote communities.



Local Generation

Installed near homes, businesses, or villages (not large power plants)



Social Impact

Enhances energy access, supports health, jobs, and education in underserved regions



Climate Benefits

Reduces fossil fuel dependence, supports clean energy transition

Current Statistics



400+ GWh

Committed for Purchase
By corporate buyers via D-REC-linked projects



1850+ Devices

Verified DRE Systems
Small-scale assets across rural and community sites



\$20 - \$30 per MWh

Average \$25/MWh
Stricter criterias reflecting dual climate and social-economic value



22 Countries

Active or Pipeline
Across Africa, Asia, and Latin America (Vietnam included)



700+ Sites

Project Sites
Verified installations across rural, semi-urban, and community-based energy system



3,500 GWh by 2030

Value of USD 100 million
Aims to uplift 3.5 million people to the Modern Energy Minimum of 1,000 KWh/person/year

D-REC Investment Decision Quadrant

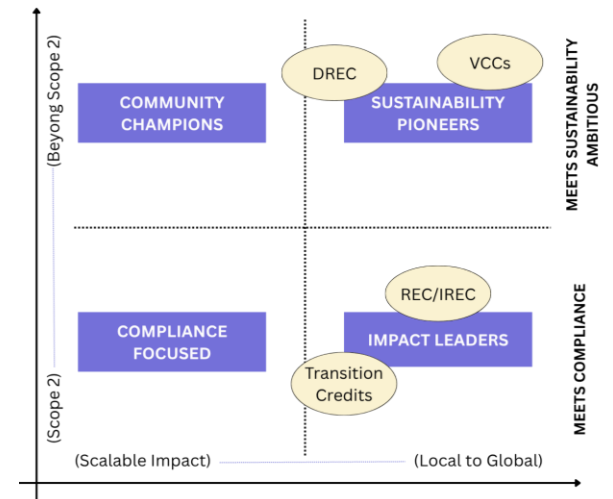
D-RECs enable corporations to position themselves at the forefront of meaningful change

Growth Trends:

1. Limited supply of quality projects
2. With the 15-year rule kicking in to qualify projects, there's a demand for new assets

Limitation:

1. Low awareness of D-REC
2. Not accepted in most compliance markets



Worldwide D-REC Developments

Growing Need for D-RECs for Multinational Companies

Current D-REC Landscape Worldwide

D-RECs are being piloted in **22+ countries** (Africa, Asia, Latin America) to support distributed renewable energy (rooftop solar, mini-grids)

D-RECs supply come from 3rd world countries, including Southeast Asia, Africa, Latin America

Attractive for large corporations due to positive impact made to customers and company

Multinationals like **Salesforce**, **Microsoft**, and **Meta** have started using D-RECs

Recent Developments

Productive Use
Partner: SOGE
Project: Solar powered irrigation pumps
Location: Cambodia
SDG Outcomes: 1, 2, 3, 5, 7, 8, 13
Social/Environmental Impact: SOGE has installed solar irrigation pumps serving ~1,500 hectares of farmland in rural, underserved communities in Cambodia. With the support of the D-REC network, the...

Financing New Projects
Partner: Solar Village Project
Project: R.S. Memorial Public School
Location: India
SDG Outcomes: 1, 2, 3, 5, 7, 8, 13
Social/Environmental Impact: D-REC revenues were used to install a 2 kW solar array for the R.S. Memorial Public School in the Patana locality of the Lucknow district in Uttar Pradesh.

Support Financing
Partner: Stella Futura
Project: Christian Health Association of Ghana
Location: Ghana
SDG Outcomes: 1, 2, 3, 5, 7, 8, 13
Social/Environmental Impact: The CHAG hospital network provides healthcare to 700,000+ patients every month, primarily women and children. The RECs helped support upfront financing

Projects supporting the lifestyle of whitespace communities

Summary

- New framework (D-REC) introduced with the purpose of **making a more tangible impact** to be reported by larger corporations
- **Recognised by I-REC standards**, it still has multiple developments to be made, including standards on solar panel farm quality
- Has been **growing in impact in Asia and South America**, with projects procuring RECs in rural areas and from microenterprises

However, proven to be challenging to push:

- Limited panel farms dedicated to D-RECs due to **difficulties building in a rural area**
- Rural communities with **limited funding for upfront costs**
- **Limited Pricing Standards – no market mechanisms to show pricing trends, etc.**

Relevance to the Project

The future framework in SEA provides additional standards and guidelines for the efficient trading of RECs and their pricing. Once the framework is finalized, there will be a surge in REC demand as companies recognize RECs' credibility. Nevertheless, currently it is a new and developing market with limited mechanisms.

Relevance of D-RECs and Stride

Stride's Projects Fit D-REC Criteria, Which Explains the Premium Pricing Quoted by PowerTrust

Stride's current deal with PowerTrust is via D-REC, selling at the price of USD 26



Vietnam Underserved Household

Additionality - underserved household would not have access to renewable energy if it were not Stride's projects



Household Businesses

Economic and social benefits – reduced expenses on electricity & higher margin for businesses



Scope 2

Solar energy replaces coal-fired power plants, reducing carbon emissions



PowerTrust is a co-leader in D-REC Initiative

It pools small producers' D-RECs and sells to big corporations



"Misalignment" with REC/I-REC Pricing in the Voluntary Market



USD 25/MWh

Premium pricing due to dual economic & social impact



USD 0.44/MWh

Low price due to oversupply



USD 30/MWh

Higher price in Asia due to limited land and solar energy supply



USD 0.70/MWh

2017 price, compliance market average USD 40

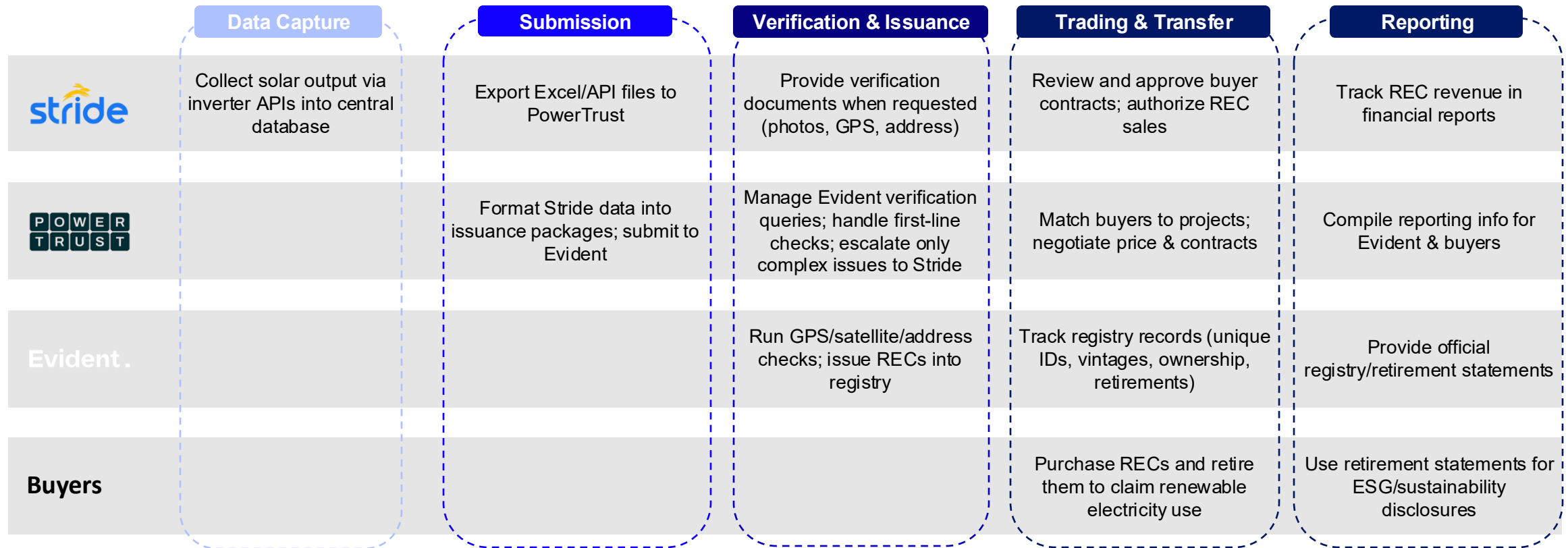
Positioning Stride's projects' RECs as D-RECs seems the most promising at this stage if the D-REC price remains this high. However, since it is a developing instrument with few standards and limited customers, it poses risks to Stride.

*Stride and PowerTrust
Business Model*



How Stride's RECs Move from Data to Retirement

Stride Captures & Submits → PowerTrust Facilitates → Evident Verifies & Issues → PowerTrust Trades → Buyers Retire

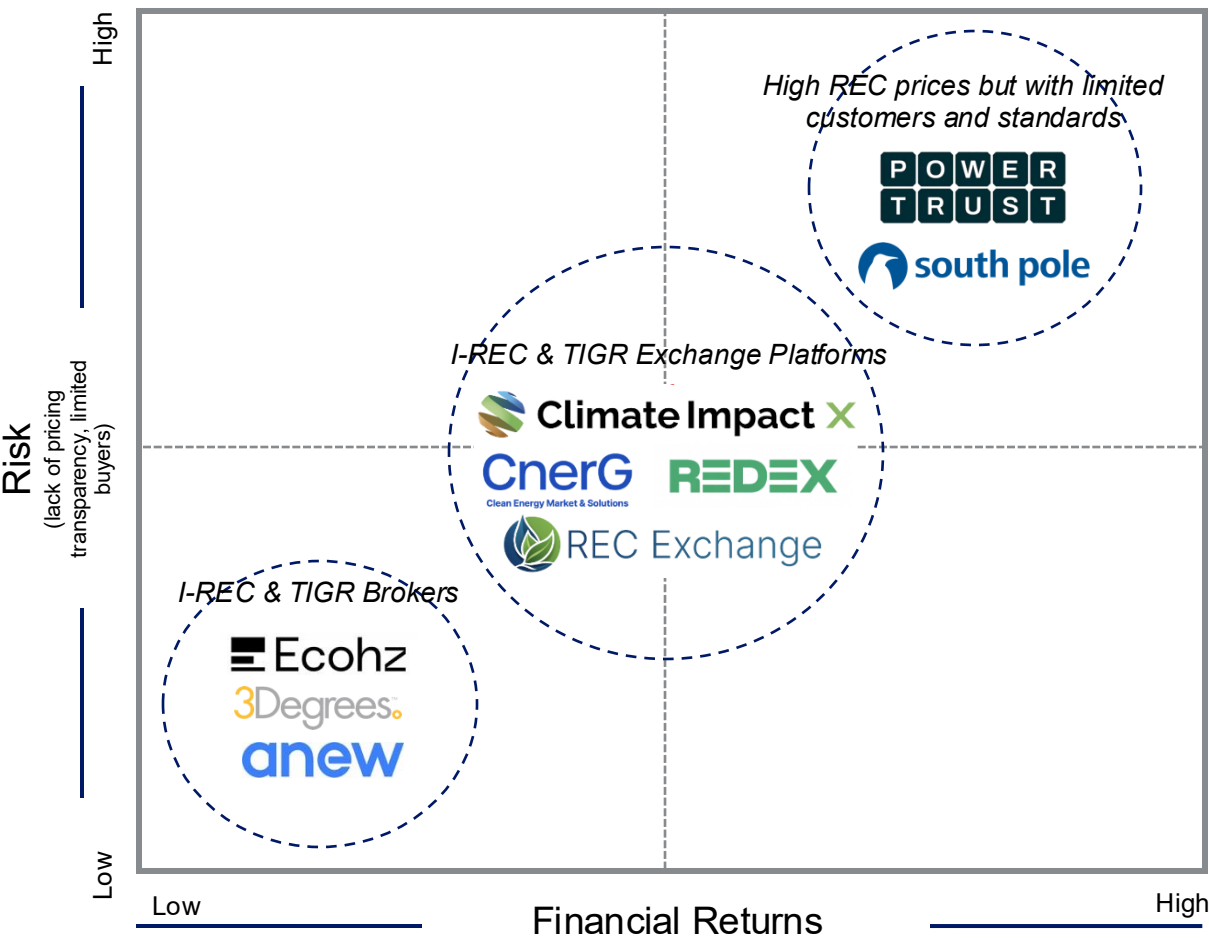


Additional Context & Takeaways

- **REC issuance is demand-led** (only issued when a buyer/contract exists), with quarterly submissions as the standard cycle.
- Data capture is automated via inverter APIs and stored in a central database. The data is already collected for operations, so **no extra effort** is needed for REC reporting.
- Stride currently benefits from a **premium REC contract** (~\$26/MWh vs. ~\$0.50 local average).
- REC income contributes **<5% of gross profit** and is treated as additional upside rather than core business revenue.

PowerTrust Compared to Other Brokers & Exchanges

Understanding PowerTrust's Business Model and Advantages Compared to Other Similar Intermediaries



Type of Intermediary	Short Description
D-REC Brokers	Pros: Able to charge high REC / D-REC premiums due to strong storytelling, verification, and ESG alignment Cons: limited buyer pool (niche market targeting high earning companies), anonymity of contract details, low liquidity due to bilateral contracts
I-REC & TIGR Exchange Platforms	Pros: High price transparency and market liquidity - live order books or auction-based pricing – lower transaction costs Cons: Lower REC price due to limited storytelling, depending on exchange platform might require for seller to register with standards themselves
I-REC & TIGR Brokers	Pros: Stable and diversified client base – guaranteed sale while handling end to end process Cons: Thin margins - highly competitive and commoditized market, focused on large corporate buyers instead of aggregation

Relevance to the Project

Different risk profiles and financial returns can provide better information for Stride to diversify their REC registries and buyers, providing good financial return and reduced risk

Stride's REC Model



Input Assumptions – REC Revenue Model (1)

Sources and Justifications

Input Lever	Assumption used	Range	Source / Derivation
Initial capacity	11.26 MWp	-	AIIF II Impact Metrics Stride 2Q2025.xlsx (cell F5)
Growth of installed MWp	50% (2026), 41% (2027), 36% (2028), 30% (2029+)	20% (conservative) – 40% (optimistic) (2029+)	3. Stride AIIF II IC (selected slides).pdf (page 22)
Capacity factor (CF)	7.8%	7% (conservative) – 10% (optimistic)	AIIF II Impact Metrics Stride 2Q2025.xlsx (own calculation)
Degradation rate	0.8%/year	1.0%/year (conservative) – 0.6%/year (optimistic)	Kirmani and Kalimullah (2017)
Ownership window	2 years	-	4. Stride Impact Reporting Company Baseline.pdf (page 16)
Opt-in rate (%)	85%	75% (conservative) – 95% (optimistic)	Australian Government (2025)
Opt-out rate (%/year)	6%	9% (conservative) – 3% (optimistic)	US Department of Energy (2016)
Sales share	95%	-	Interview with Andrew Fairthorne, CEO, Stride (Sep 2025, personal communication)
REC price	\$26/REC	\$0.5/REC - \$26.0/REC	Interview with Andrew Fairthorne, CEO, Stride (Sep 2025, personal communication)
Toggle: Post-repayment rights	NO	-	-

Input Assumptions – REC Revenue Model (2)

Sources and Justifications

Input Lever	Assumption used	Range	Source / Derivation
One-off overhead	\$35'000	\$75'000 (conservative) – \$15'000 (optimistic)	DFDL, (2025) & Dogtiev (2025)
Annual overhead	\$25'000	\$50'000 (conservative) – \$12'000 (optimistic)	Salaryexpert, (n.d.)
Customer incentive type	Cash buy-back / Insurance / Maintenance	-	-
Incentive percentage of REC price	50%	-	GetSolar (2025)
Minimal incentive price	\$0.25	-	Half of I-REC Vietnam market price
Maximal incentive price	\$6.00	-	Hamrick et al. (n.d.) (Estimate)
Insurance cost (USD/REC)	\$3.89	\$4.66 (conservative) – \$3.11 (optimistic)	3. Stride AIIF II IC (selected slides).pdf (page 52-54) (own calculations) & National University of Singapore et al. (2020, p. 69)
Maintenance case	Base case / Adjusted cost breakdown	-	-
Base case (USD/REC)	\$7.54	\$11.27 (conservative) – \$5.52 (optimistic)	Pangonilo (2025) & National Renewable Energy Laboratory of the U.S. Department of Energy (2023) & National University of Singapore et al. (2020)
Adjusted cost breakdown (USD/REC)	\$5.36	\$7.93 (conservative) – \$3.89 (optimistic)	3. Stride AIIF II IC (selected slides).pdf (page 39) & Economic Research Institute (n.d.) & Salaryexpert (n.d.) & Liu (2021) & National Renewable Energy Laboratory of the U.S. Department of Energy (2020) & AL MATIN et al. (2019) & own calculations

*RECs
Vs.
Verified Carbon Credits*



AlterCop30's Take on Verified Carbon Credits compared to RECs

Experts suggest to stick with RECs especially because of trends in high impact projects

Stride should FOCUS on RECs

Instead of Registering VCCs...



Key Items



- Focus on Scope 2 emissions, usually meant for electricity usage
- More standards created by I-REC, less ambiguity on prices and contract terms
- 1MWH produced from electricity production = 1 REC
- **Usually all RECs are SOLD**



- Focus more on Scope 1 and Scope 3 emissions
- More widespread and ambiguous, considering any project that is proven to reduce carbon emissions
- Fewer standards – with around 200 methodologies right now
- **Not all VCCs are SOLD**

Application to Stride



- **More applicable to Stride** → more focused on electricity while being standardised and less risky



- More ambiguous with larger price fluctuations, projects also range from nature projects to tree planting – **not suitable for Stride**

Trends



- More investors are looking for high-impact projects to avoid claims of greenwashing, and making an impact to society
- Future trends to develop the grid – it is possible, but political climates of multiple countries make it difficult (e.g. Vietnam to Singapore)



- More efforts on blockchain to ensure no double counting of VCCs
- Price for VCC is overall dropping with more projects in place
- Instead of VCCs, transition credits are more in demand in recent years