THE INTERNATIONAL REC STANDARD

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Asia Clean Energy Forum:

Opportunities in the APAC REC Markets

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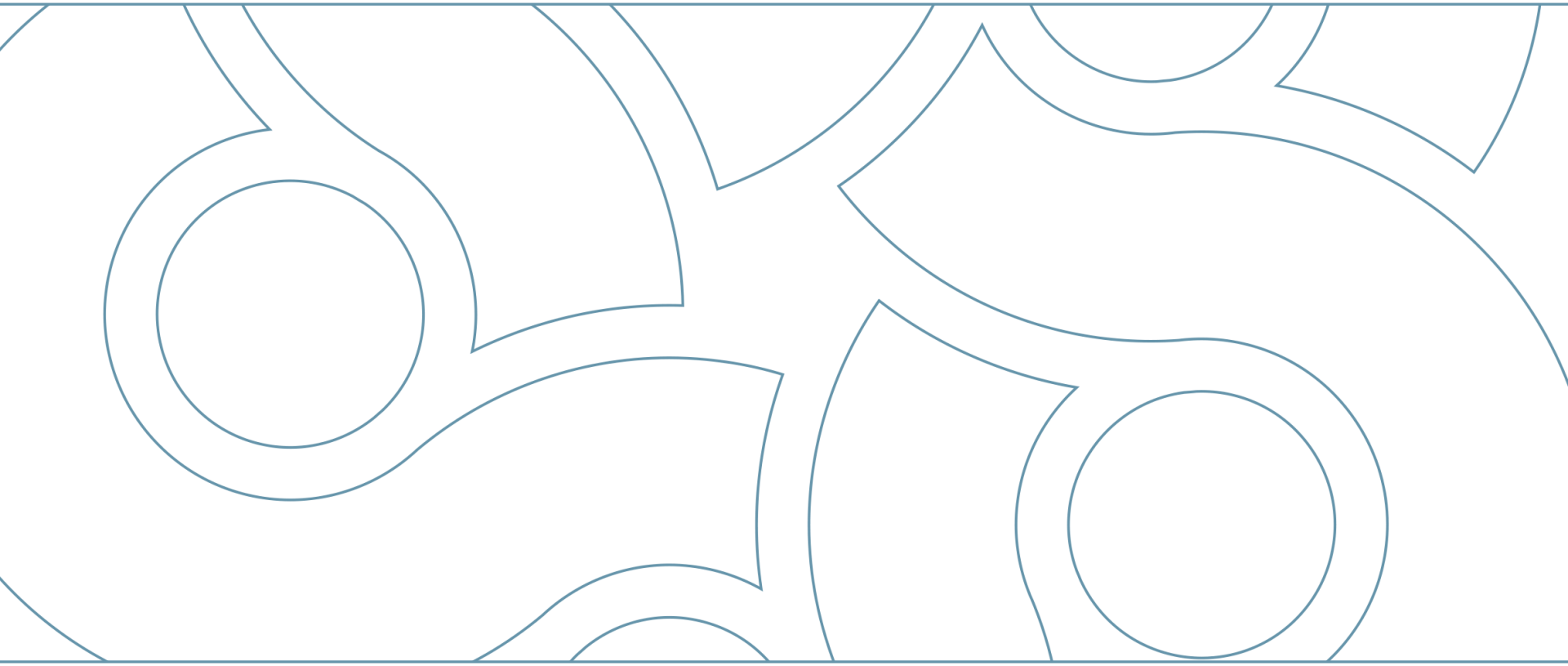
The International REC Standard Foundation

Today We'll Cover…

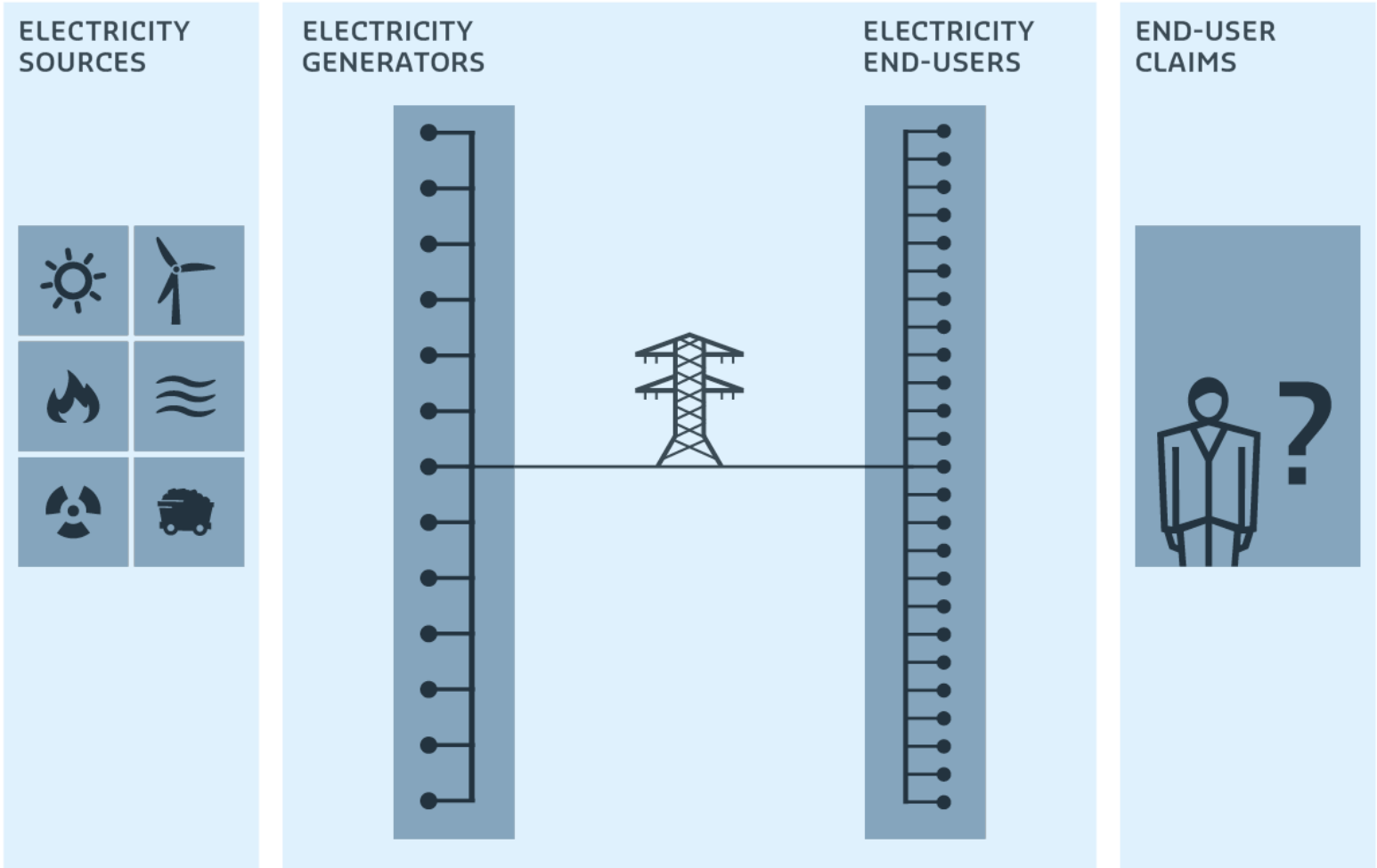
- Overview of RECs
- Opportunities in APAC
- Transaction Volumes (if there's time/interest)

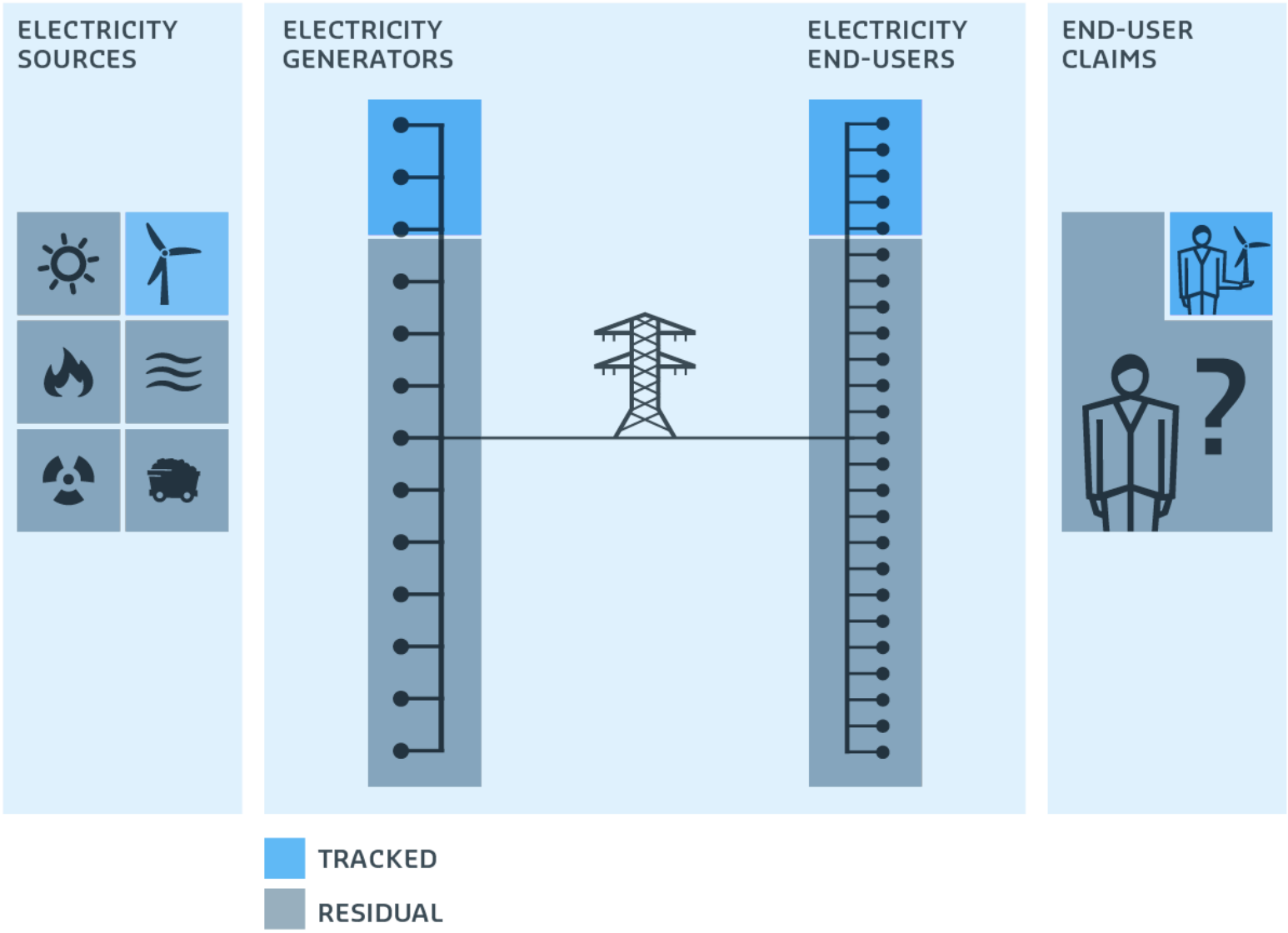
THE INTERNATIONAL REC STANDARD

Part 1: Overview of RECs



Renewable energy certificates (RECs) tells us where our electricity comes from.


ELECTRICITY SOURCES
ELECTRICITY GENERATORS
ELECTRICITY END-USERS
END-USER CLAIMS
?
TRACKED
RESIDUAL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RECs tells us where our electricity comes from.

A REC tells us facts, or "attributes":

- 1MWh of power was generated by a renewable source.
- When, where, and who generated this MWh.
- This information has been confirmed by a trusted source or "standard".
- Someone owns these "green attributes" and can transfer or claim ownership.

Other names: Guarantee of Origin (GO), Renewable Energy Certificates (RECs).

Demand: Who Consumes EACs?

CDP
DRIVING SUSTAINABLE ECONOMIES

~~8,000~~ 13,000+ companies reporting worldwide

(2% of companies worldwide, worth $12 trillion report through CDP)

RE 100

~~263~~ 400+ companies promise 100% renewable

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

~~992~~ 2,500+ companies taking action

Demand Perspective

- **Why renewable electricity?**
  - **Pure economics:** Business leadership and competition.
  - **Pure economics, again:** Price (hedging) and policy influence.
  - **The "right thing to do":** Less of a driver. Let's be honest.

- **Why use RECs?**
  - **Access:** only way to get and claim renewables from the power pool.
  - **Reporting:** disclosure to CDP, RE100, and others is based on best practice guidelines, which require use of certificates.
  - **Ownership:** green power without RECs is like a car with no title, yes, even under direct-line PPAs and onsite installations.

GREENHOUSE GAS PROTOCOL

https://ghgprotocol.org/scope_2_guidance

Demand: Who Consumes RECs?

Source: RE100 slide of participants.

THE INTERNATIONAL REC STANDARD

Demand: Who Buys?

Source: RE100 slide of participants, 1 year later.

Demand Perspective

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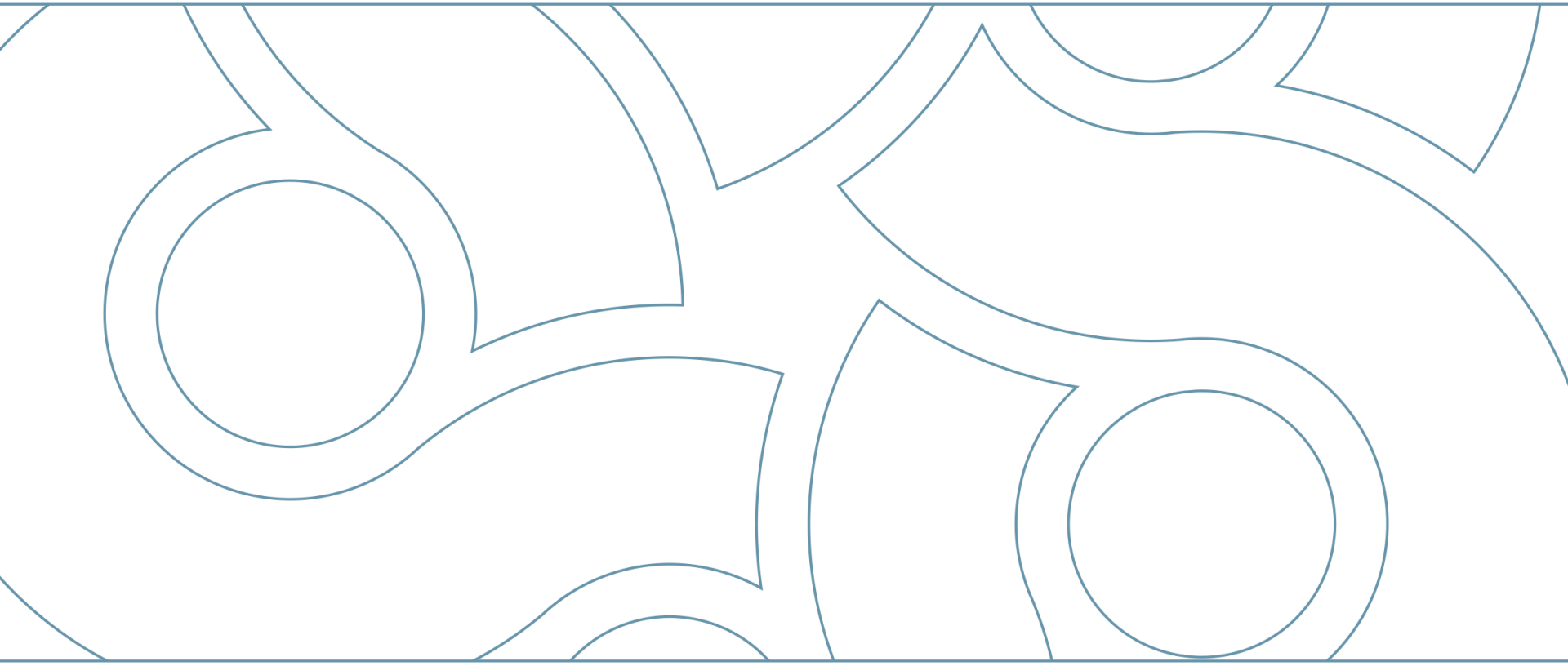
Seller's Perspective

- **It's all about the money…**
- **The following stakeholders can make money by…**
  - IPP/Asset owner/developer → Sell RECs, multiple paths to market
  - Utilities, Electricity Retailers, and Distribution Utilities (DUs)→ green tariffs
  - Commodity brokers and traders → Trade till landing at corporate
  - Corporations with self-owned asset → self consumption (for clean claims)
  - National authorities → Green tariffs and phase out subsidies
  - Development Partners…?

Part 2: Opportunities in APAC



RECs are NOT just an "unbundled" certificate.

They are used for tracking physical transactions as well!

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HOW? Transaction Structures

Structure	Description
Unbundled	• Certificate only, totally separate from power • Electricity from one source, RECs from another • (HINT: Go talk to the traders/brokers in the room!)
Bundled 	• Electricity + certificate, sold together • RECs used to track: • Power Purchase Agreements (PPA) with developer • Solar rooftops (self-consumption) with developer • Utility "green tariff" products (for homes and businesses) from retailer

What to Look For Next

- **<u>Procurement models are changing</u>**
  - **How:** Bundled and longer-term contracts (green tariffs and PPAs)
  - **How much:** Price transparency shifts business models (value → volume)
  - **Who buys:** Supply chains will become the new demand hub

- **<u>Market boundaries *could* open</u>**
  - Currently, markets are isolated
  - Growing interest in expanding boundaries
  - RECs are a "make-or-break" for cross border transmission financing

Thank you!

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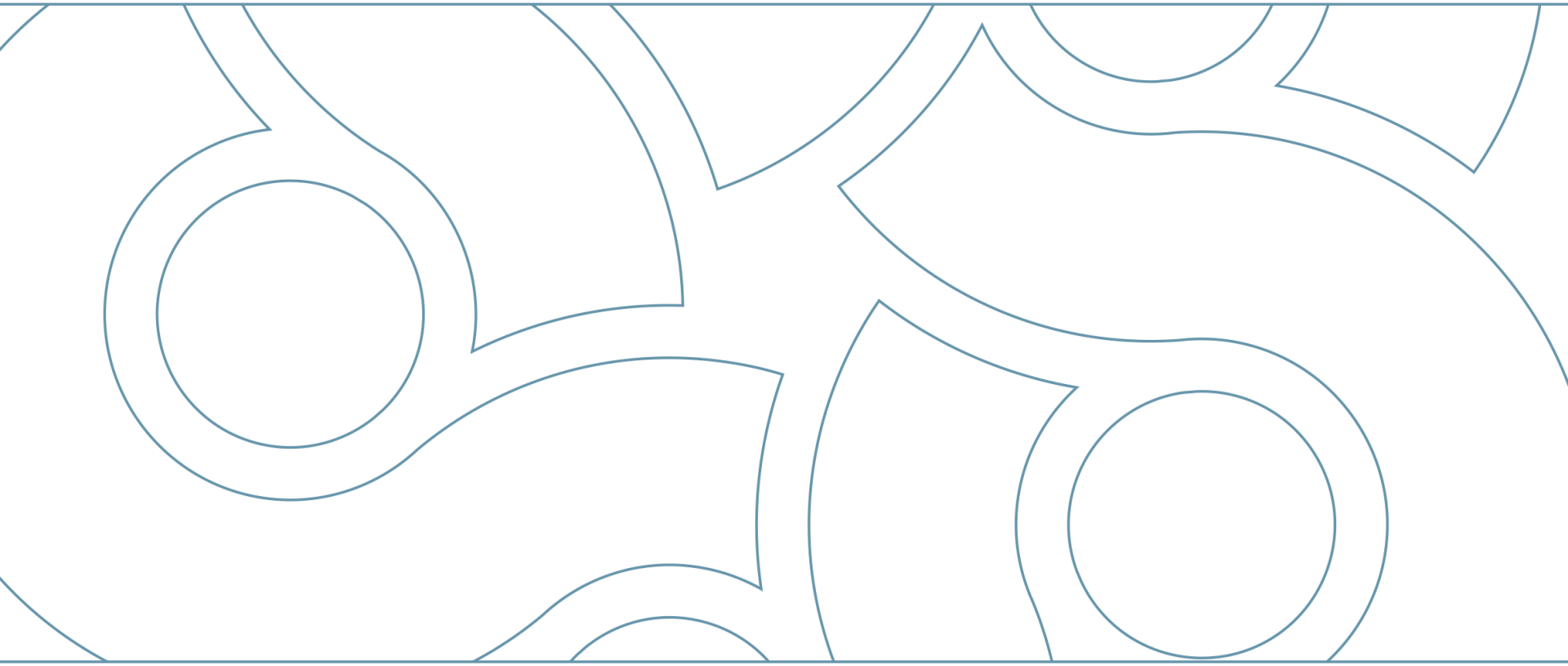
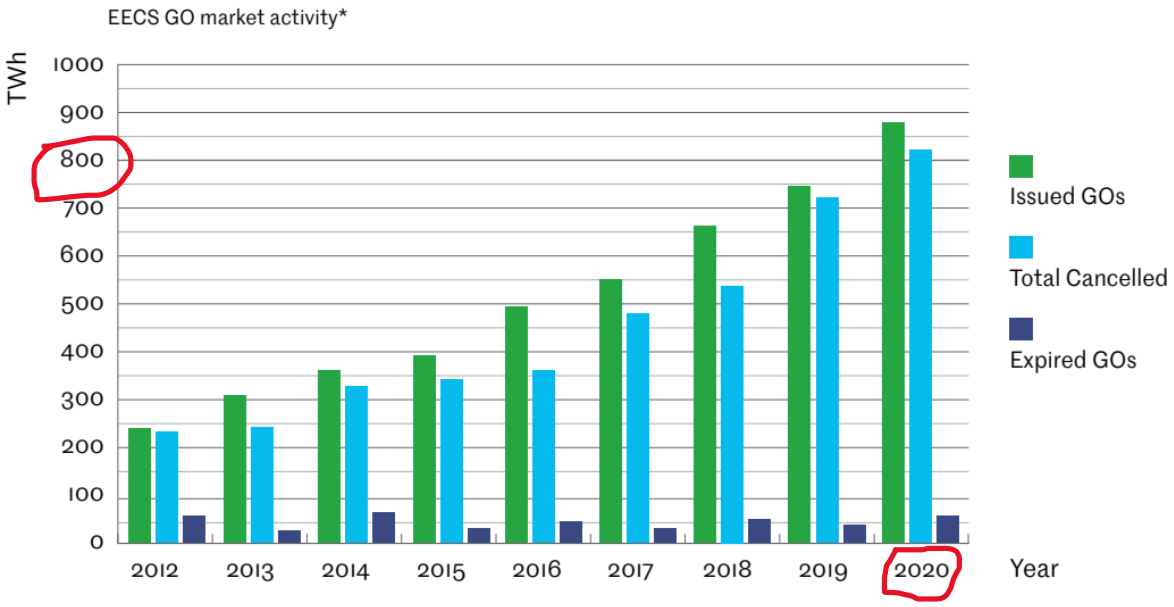
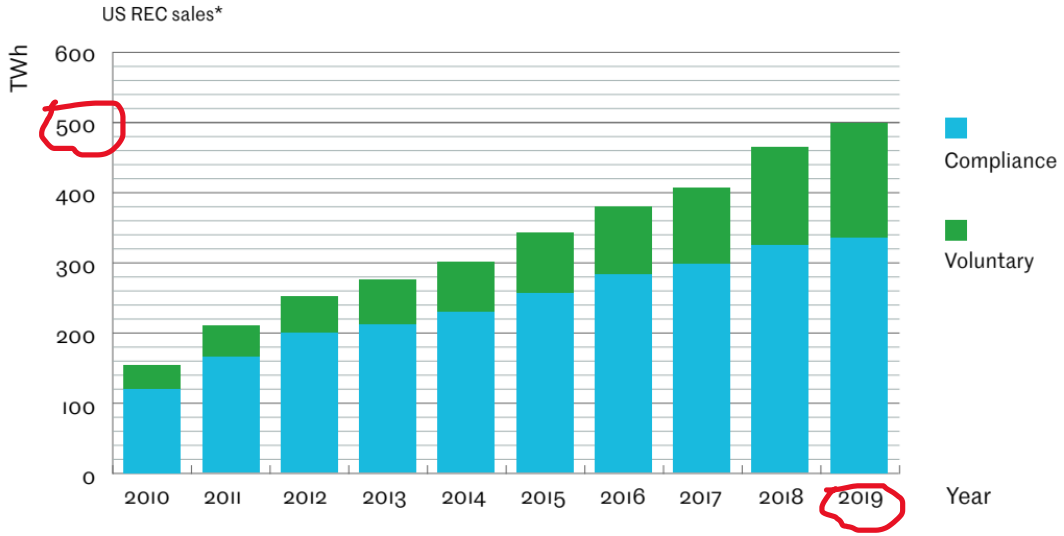
Part 3: Transaction Volumes



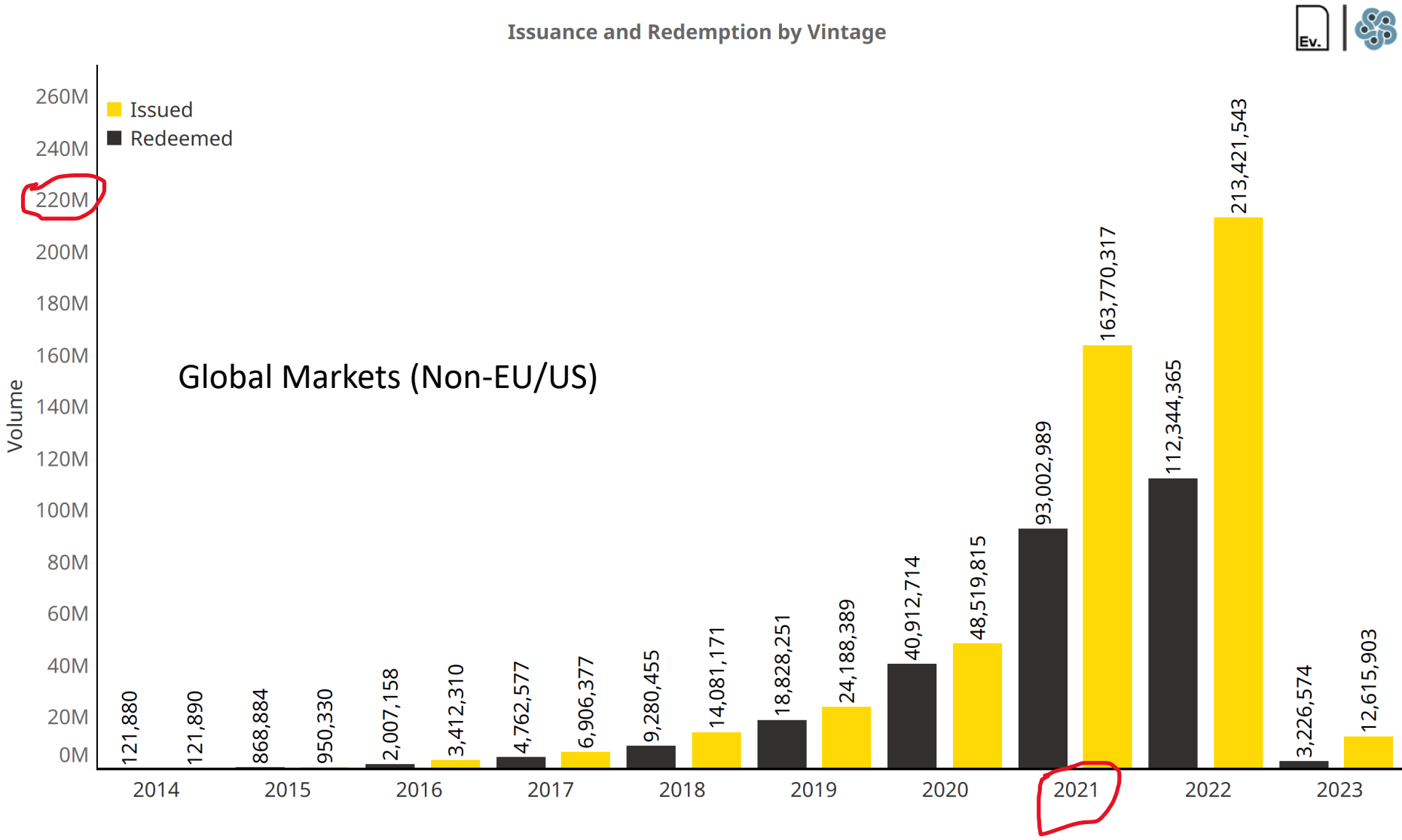
EU Markets

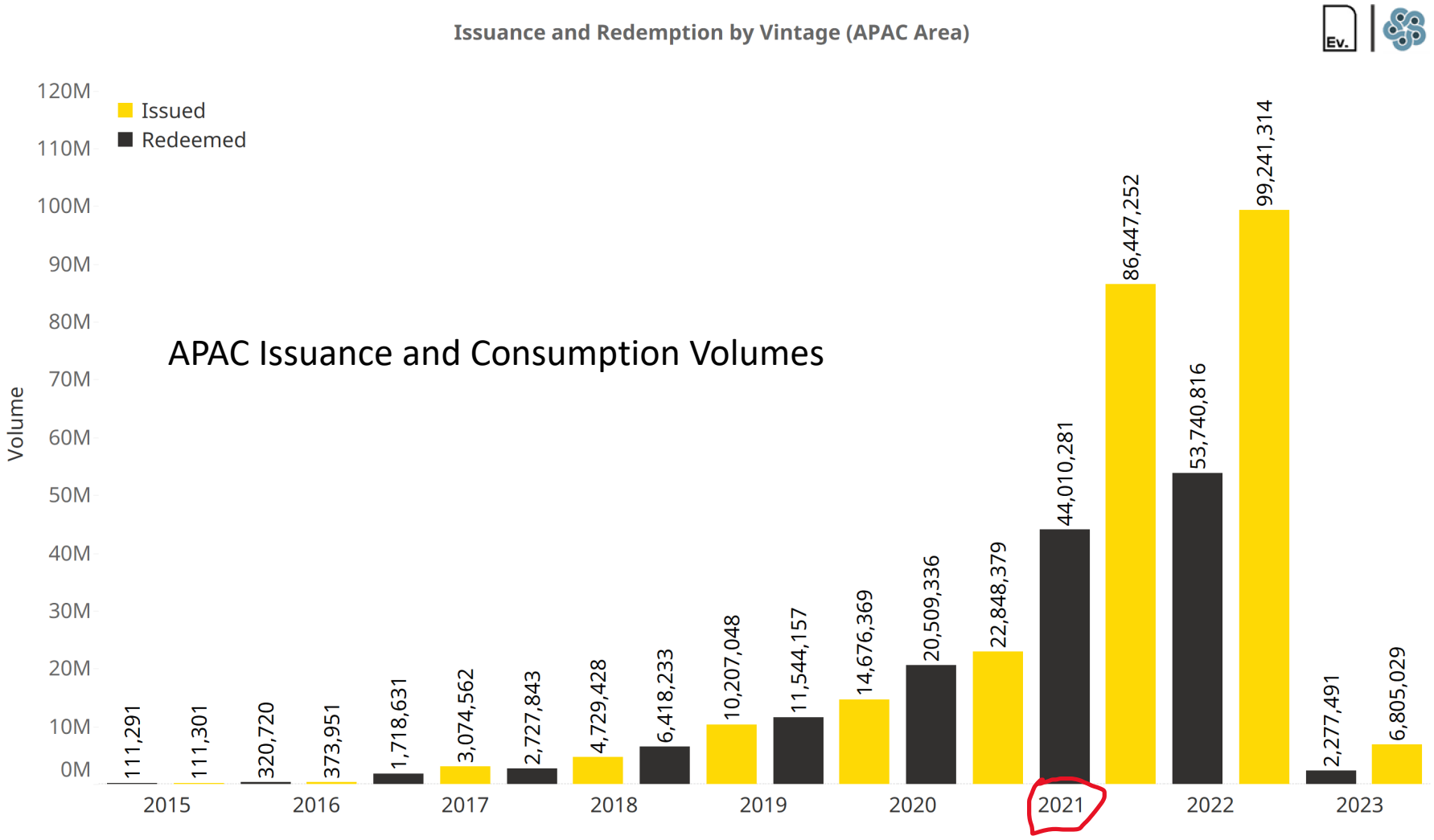


US Markets



*Source: National Renewable Energy Laboratory (NREL) and Lawrence Berkeley National Lab)


Issuance and Redemption by Vintage
Issued
Redeemed
Global Markets (Non-EU/US)
Volume
260M
240M
220M
200M
180M
160M
140M
120M
100M
80M
60M
40M
20M
0M
121,880
121,890
868,884
950,330
2,007,158
3,412,310
4,762,577
6,906,377
9,280,455
14,081,171
18,828,251
24,188,389
40,912,714
48,519,815
93,002,989
163,770,317
112,344,365
213,421,543
3,226,574
12,615,903
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023


Issuance and Redemption by Vintage (APAC Area)
APAC Issuance and Consumption Volumes
Issued
Redeemed
Volume
120M
110M
100M
90M
80M
70M
60M
50M
40M
30M
20M
10M
0M
111,291
111,301
320,720
373,951
1,718,631
3,074,562
2,727,843
4,729,428
6,418,233
10,207,048
11,544,157
14,676,369
20,509,336
22,848,379
44,010,281
86,447,252
53,740,816
99,241,314
2,277,491
6,805,029
2015
2016
2017
2018
2019
2020
2021
2022
2023

This tells us…

- **EU markets are the largest (800), followed by the US (500).**
  - Both have about doubled **since** 2014

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- **International markets are growing faster and will take over.**
  - Issuance has doubled **each year** since 2014

This tells us…

- **EU markets are the largest (800), followed by the US (500).**
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- **International markets are growing faster and will take over.**
  - Issuance has doubled **each year** since 2014
- **APAC accounts for half of total Issuance and Consumption.**
  - Issuance has doubled **each year** since 2014

Most Common Question

(other than price)

What's the difference between RECs and Carbon Credits?

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Topic	REC	Carbon Credit
Unit of Measure	• MWh	• Tons of avoided $CO_2(e)$
How its measured	• Meter readings (fact-based)	• Methodologies (assumption-based)
Issuance Process	• Meter or financial data verified (simple)	• Consultants estimate using product methodologies (complex)
What it's used for	• Scope 2 (emissions from electricity consumption)	• Scope 1 and 3 (everything else: direct emissions and downstream supplies)

Use Cases

There is much more to RECs than unbundled transactions!

Market Structures

- **Voluntary**:
  - Companies choose to go green.
  - They use EACs to prove it, in line with reporting frameworks like RE100, the Science Based Targets Initiative, and Race to Zero.

- **Compliance**:
  - The government determines that certain entities (usually the utility or power retailers) need to use X% renewables.
  - Renewable Portfolio Standards (RPS) and Renewable Portfolio Obligations (RPOs) are common examples.

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Structure	Description	Why/Why Not?
"Attribute Only" (Unbundled)	• Certificate, totally separate from power. • Bilateral and trilateral deals.	Access Easy Easy Extra cost
PPAs and Leasing (Bundled)	• Grid moves power, EACs move "green".	Impact—additionality Free EACs or low cost Lack of understanding Policy barriers
Tracking Self Consumption (Bundled)	• Own assets, issue EACs, redeem EACs.	Impact—additionality Free EACs or low cost Lack of understanding Up front costs
Green Tariffs (Bundled)	• Utility or retailer sells power+RECs	Easy Often unavailable Extra cost