Asia Clean Energy Forum:

Opportunities in the APAC REC Markets

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Today We’ll Cover...

- Overview of RECs
- Opportunities in APAC
- Transaction Volumes (if there’s time/interest)
Part 1: Overview of RECs
Renewable energy certificates (RECs) tells us where our electricity comes from.
Introduction to the I-REC Standard

ELECTRICITY SOURCES

ELECTRICITY GENERATORS

ELECTRICITY END-USERS

END-USER CLAIMS

TRACKED
RESIDUAL
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?

8,000 13,000+ companies reporting worldwide
(2% of companies worldwide, worth $12 trillion report through CDP)

263 400+ companies promise 100% renewable

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.

https://ghgprotocol.org/scope_2_guidance
Demand: Who Consumes RECs?

Source: RE100 slide of participants.
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!
# HOW? Transaction Structures

<table>
<thead>
<tr>
<th>Structure</th>
<th>Description</th>
</tr>
</thead>
</table>
| **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

- **Procurement models are changing**
  - **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

- **Market boundaries could open**
  - 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*
Global Markets (Non-EU/US)

Issuance and Redemption by Vintage

- Issued
- Redeemed

Volume

2014: 121,180
2015: 121,180
2016: 868,884
2017: 950,330
2018: 2,007,158
2019: 3,412,310
2020: 4,762,577
2021: 6,906,377
2022: 9,280,455
2023: 14,081,171
2024: 18,828,251
2025: 24,188,389
2026: 40,912,714
2027: 48,519,815
2028: 93,002,989
2029: 163,770,317
2030: 213,421,543
2031: 3,226,574
2032: 12,615,903

Redemption for 2021 is approximately 220M.
APAC Issuance and Consumption Volumes

Issuance and Redemption by Vintage (APAC Area)

- **Issued**
- **Redeemed**

Year | Issuance | Redemption | Total
--- | --- | --- | ---
2015 | 111,291 | - | 111,291
2016 | 320,720 | - | 320,720
2017 | 718,631 | - | 718,631
2018 | 2,727,843 | 4,729,428 | 7,457,271
2019 | 6,418,233 | 10,207,048 | 16,625,281
2020 | 14,676,369 | 20,509,336 | 35,185,705
2021 | 22,848,379 | 44,010,281 | 66,858,658
2022 | 86,447,252 | 53,740,816 | 140,188,068

Note: The diagram shows the issuance and redemption volumes by vintage for the APAC area. The highest issuance volume is in 2022, with a redemption volume in 2021.
This tells us...

- EU markets are the largest (800), followed by the US (500).
  - Both have about doubled since 2014
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- **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?
<table>
<thead>
<tr>
<th>Topic</th>
<th>REC</th>
<th>Carbon Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit of Measure</strong></td>
<td>• MWh</td>
<td>• Tons of avoided CO₂(e)</td>
</tr>
<tr>
<td><strong>How its measured</strong></td>
<td>• Meter readings (fact-based)</td>
<td>• Methodologies (assumption-based)</td>
</tr>
<tr>
<td><strong>Issuance Process</strong></td>
<td>• Meter or financial data verified (simple)</td>
<td>• Consultants estimate using product methodologies (complex)</td>
</tr>
<tr>
<td><strong>What it’s used for</strong></td>
<td>• Scope 2 (emissions from electricity consumption)</td>
<td>• Scope 1 and 3 (everything else: direct emissions and downstream supplies)</td>
</tr>
</tbody>
</table>
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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<tr>
<th>Structure</th>
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<th>Why/Why Not?</th>
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</table>
| "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     | • 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                           |