2023年中国可再生能源证书 (RECs) 市场研讨会

REDEX

THE INTERNATIONAL REC STANDARD

议程
Agenda

1:30 PM - 2:00 PM:	登记	Registration at reception
2:00 PM - 2:15 PM:	开场致辞：演变中的市场动态-塑造中国和东盟REC市场的未来 *主讲人：REDEX 欣耀创始人兼首席执行官，甘正伟*	Opening Speech: Evolving Market Dynamics: Shaping the Future of the RECs Market in China and ASEAN
2:15 PM - 2:30 PM:	主题1：I-REC商业生态与平台运营商 *主讲人：I-REC 基金会东盟区董事，Roble Poe Velasco-Rosenheim*	Topic 1：About I-REC Ecosystem and Platform Operator role
2:30 PM - 2:50 PM:	主题2：跨境RECs-欧盟碳边境调节机制 （CBAM）的机遇和挑战 *主讲人：I-REC 基金会执行董事，Jared Braslawsky*	Topic 2：Cross-Border REC with a focus on CBAM: Opportunities and Challenges
2:50 PM - 3:10 PM:	主题3：使用REDEX RECs数字解决方案 *主讲人：REDEX 欣耀首席运营官，李志荣*	Topic 3：Leveraging value of REDEX's RECs Digital Solutions
3:10 PM - 3:30 PM:	主题4：通过RECs最大化投资回报-分布式光伏系统的视角 *主讲人：天合富家能源股份有限公司经理，于佳*	Topic 4：Maximising Returns on Investment Through Renewable Energy Certificates: Perspective from Distributed Solar PV System Owners
3:30 PM - 4:00 PM:	专题讨论：驱动中国REC需求的因素	Panel Discussion: Drivers for RECs demand in China
4:00 PM - 4:30 PM:	交流和茶歇	Networking and Refreshments
4:30 PM - 5:00 PM:	专题讨论: 中国可再生能源证书的供应	Panel Discussion: RECs supply in China
5:00 PM - 5:20 PM:	闭幕致辞：中国和亚洲REC未来	Closing Speech: Future of RECs in China and Asia
5:20 PM - 5:45 PM:	自由交流	Networking

开场致辞：演变中的市场动态-塑造中国和东盟REC市场的未来

Opening Address: Shaping the Future of the RECs Market in China and ASEAN

主讲人：REDEX 欣耀创始人兼首席执行官，甘正伟

Trace, Trade, Trust
www.redex.eco

REDEX 欣耀创始人兼首席执行官，甘正伟

甘正伟先生 是可再生能源领域的行业资深人士，并对整个太阳能价值链拥有深入的了解，包括上游设备制造商（Applied Materials）到下游项目开发和电力零售（REC Solar）的销售/业务发展职位，有着15年的丰富经验。

他于2018年创立了REDEX（原名T-RECs.ai），意在解决亚洲市场上，可再生能源买家与发电企业之间缺乏沟通的痛点。为每个企业寻求长期稳定的可再生能源的电力购买协议相当困难，因而可再生能源证书（或 RECs）是实现其二氧化碳排放Scope 2中性目标的唯一可行、高效和有影响力的选择。

正伟以及 REDEX 正在建立一个面向环境、社会和公司治理（ESG）的世界所需的IT基础设施。REDEX的旗舰产品REHash正在成为亚洲最大的RECs市场，为更多的国家的绿证提供价格透明度.

正伟也参与了（SS）673：Code of Practice for Renewable Energy Certificates (REC) 的委员会，为新加坡再生能源的发展给予不少的推动与贡献。

Opening Address - Shaping the Future of the RECs Market in China and ASEAN

July 2023

12 July 2023

Introduction to RECs

July 2023

Trace, Trade, Trust
www.redex.eco

区域经济共同体简介

- **可再生能源证书：**
- 代表发电“可再生性”的可交易工具
- **1 REC =** 来自可再生能源的1 MWh
  - 抵消范围 2 排放（购买电力的间接温室气体排放）
  - **RE100*认可的REC注册管理机构：**

1) RECs（美国和加拿大）
2) GOs 或 REGO（欧洲）
3) LGC/STC (澳洲)
4) J-Credit/绿色电力证书（日本）

合规市场

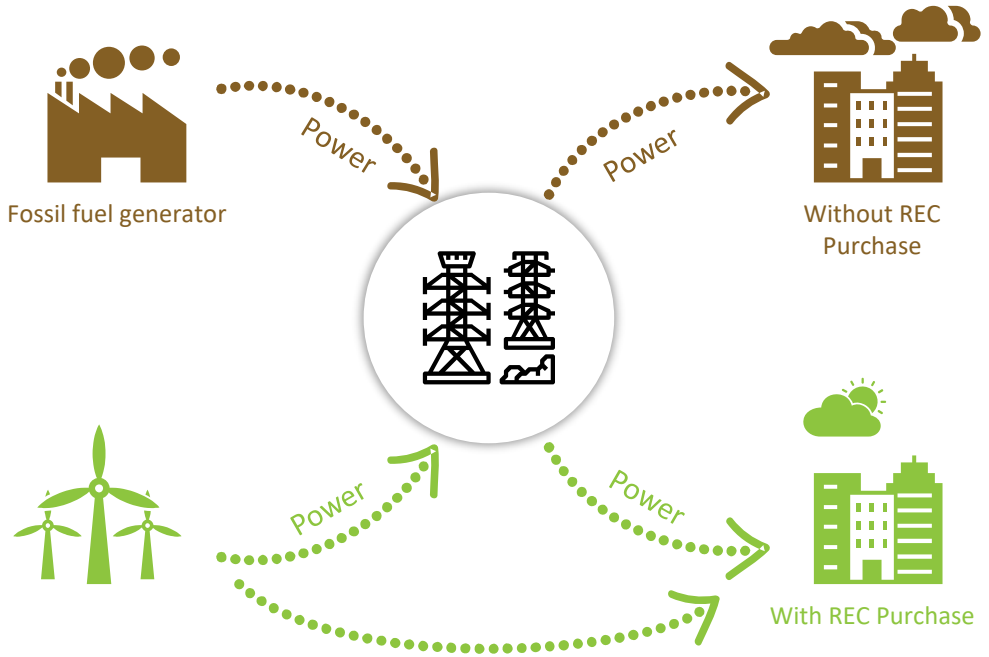
5) I-REC （国际）
6) TIGR (国际)

自愿市场

**RE100：领先的REC买家组织*

可再生能源证书与碳信用之间的基本区别

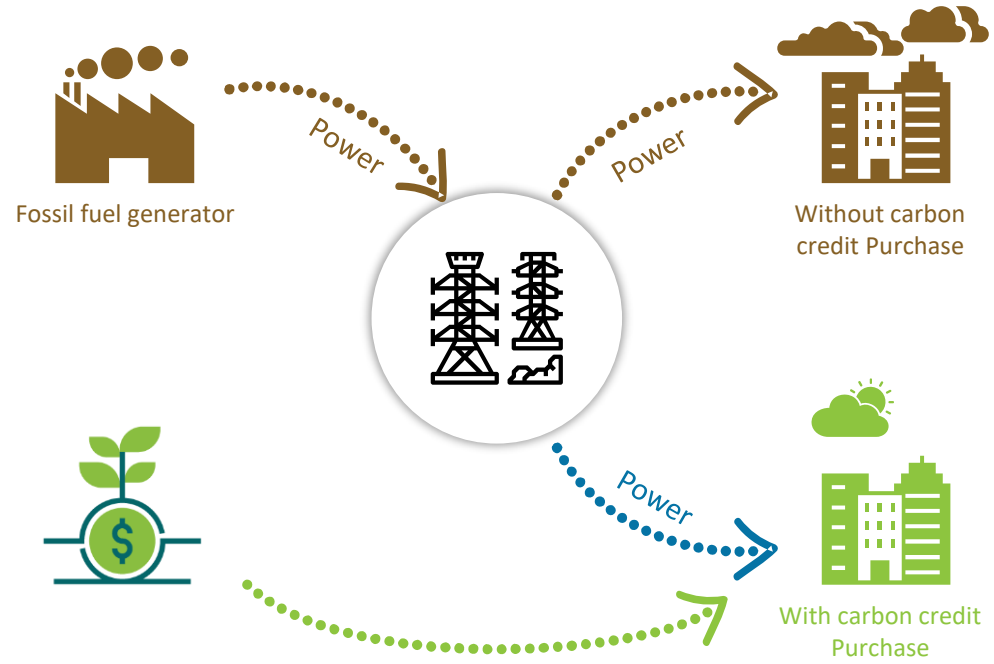
可再生能源证书



通过购买REC，您可以将功耗与可再生能源联系起来，从而避免同一电网中的“脏”电子。因此，您一开始就没有排放二氧化碳。

关键概念是REC的跟踪/核算，最终结果与签订购电协议（PPA）没有什么不同。

碳信用额



通过购买碳信用，您消耗了电网的“脏”电力，但通过一个单独的碳项目来抵消它，以减少碳排放。因此，您先排放了二氧化碳（CO2），但随后抵消了它。

进一步需要“额外性”的概念来证明“避免碳信用”（与清除碳信用）的合理性。

资料来源：美国环保署绿色电力伙伴关系，T-RECs

用REC来核算温室气体排放范围二的好处*

优势

1）简单 — 唾手可得的效果

- 容易理解

- 在企业可持续发展计划里最简单的实施方案

2）溯源

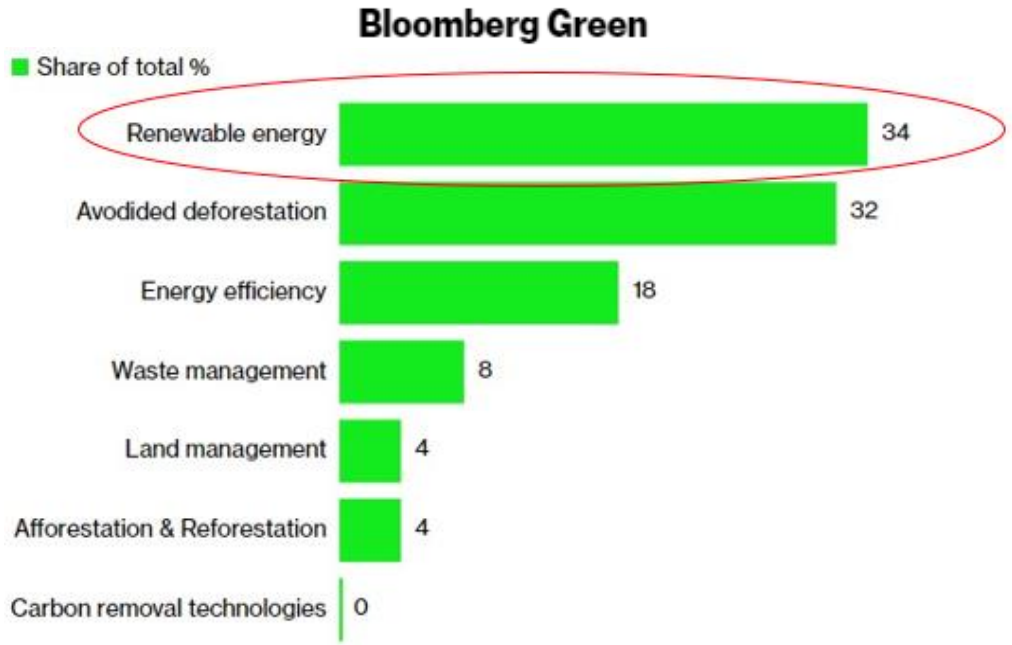
- 将每个兆瓦时(MWh) 追溯到其产生的时间和位置

- 难以作假，无漂绿的风险

3）碳信用额不再可用于RE！

- 从2021年开始，Verra不允许可再生能源项目发放碳信用额**

可再生能源曾经是碳权最大的来源的起源，但现在不允许这样做了**



资料来源：2020年TSVCM库存分析

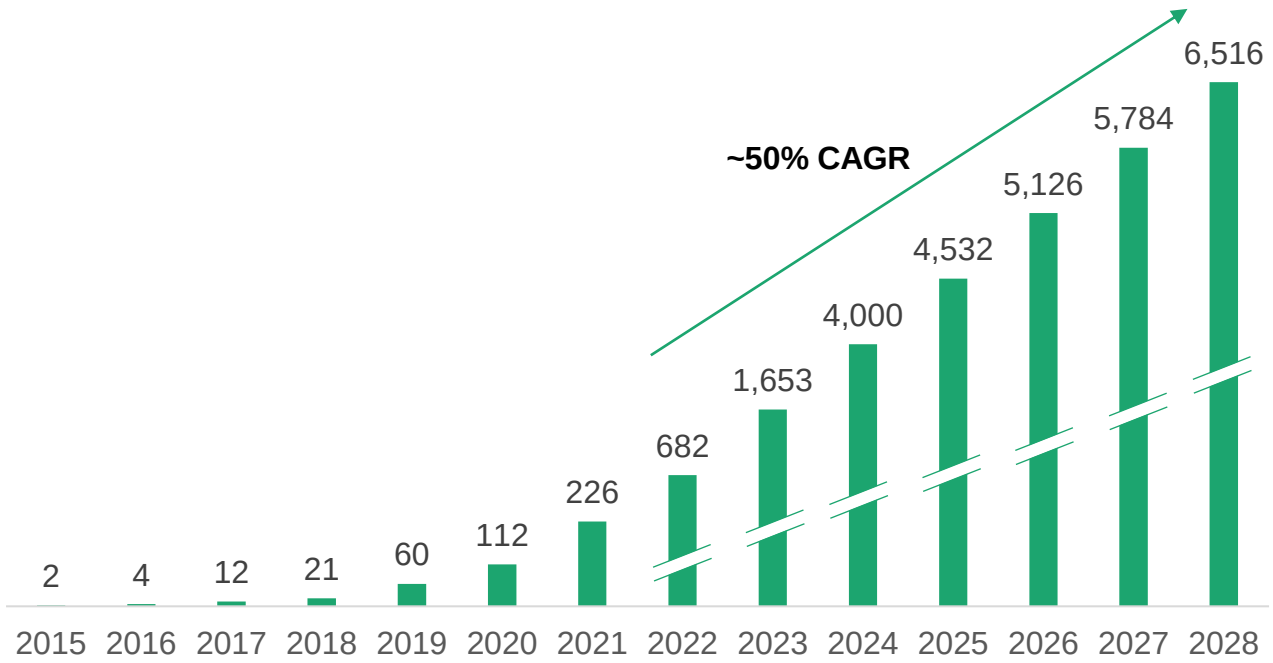
**与碳信用额相比，比较表见上一张幻灯片*

***Verra VCS 标准 2021 年 4 月不允许非最不发达国家 （LDC） 的所有可再生能源项目*

2023年EAC/REC自愿市场 *复合年增长率为 ~50% 将成为 ~16 亿美元业务，

REDEX

Voluntary RECs Market Size ($, Mn)



资料来源：I-REC，可再生能源容量（实际）
**假设3美元价格计算的市场规模*

关键要点

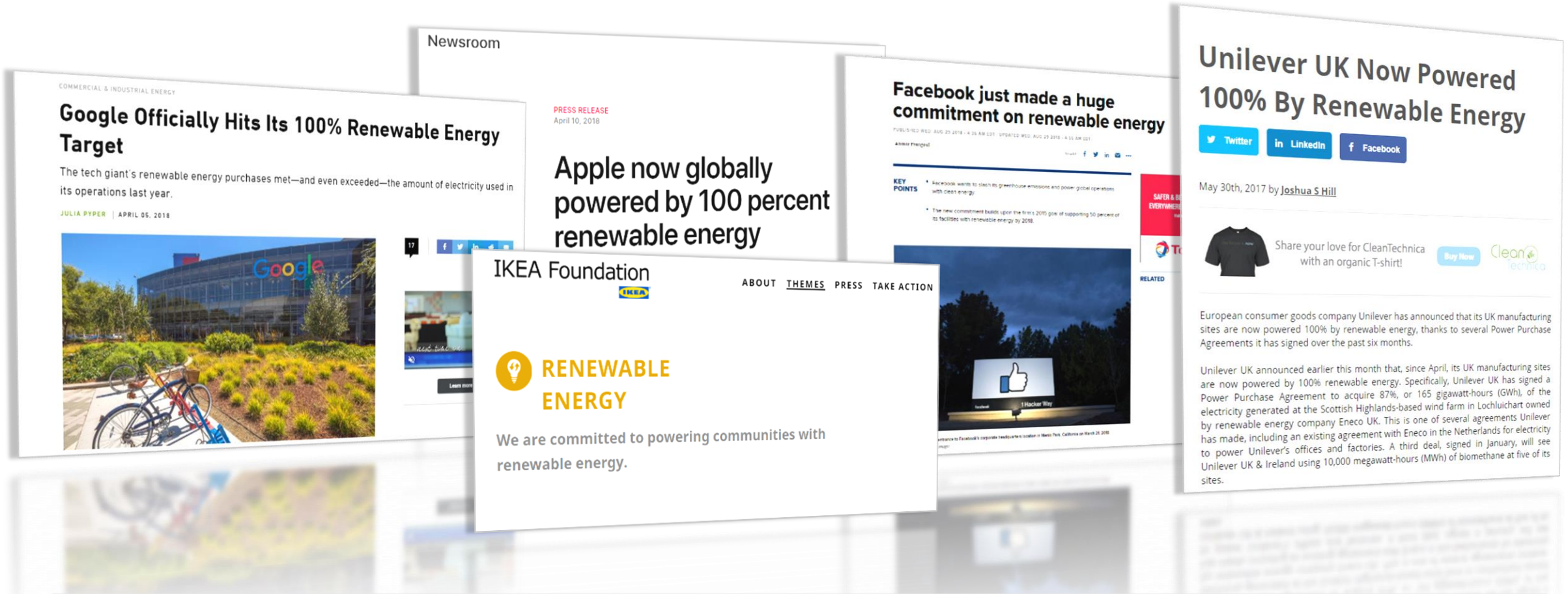
- 亚洲是EAC/REC全球最大的自愿市场，占~57%的份额，其次是南美38%和世界其他地区5%
- 预计在未来 2022-2028 年期间，市场交易量将增长 10 倍
- 2021年自愿市场仅占可再生能源发电设备总容量的~10%（大部分发电设备尚未注册REC发行）

South East Asia – The Supply Chain Driver

July 2023

Trace, Trade, Trust
www.redex.eco

过渡到绿色能源



世界上最大的科技公司及其供应链都要求可再生能源来实现其ESG目标

RE100 & Supply Chain – 关键需求驱动力

脱碳驱动因素

外部参与者

国际机构　政府　社会团体

消费者　竞争对手

内部参与者

员工　人才　投资者　供应商

RE100引领企业脱碳

RE100

国际可再生能源倡议汇集了近400家企业

范围 2（和 3）排放的 REC

~75% 的 RE100 成员的目标是到 2030 年实现 100% RE

范围 2 排放

Verra最近不允许可再生能源项目发放碳信用额*

范围 3 排放

企业开始对其供应链施加可再生能源要求。

资料来源：全球气候倡议

**Verra VCS 标准 2021 年 4 月不允许非最不发达国家（LDC）的所有可再生能源项目*

市场参与者

谁是卖家？

可再生能源发
电厂投资者

屋顶太阳能业主

谁是买家？

制造业
供应链

工业园区
商业与工业

数据中心
科技与数字行业

运输
物流、航空

温室气体排放者
石油和天然气，炼油厂

为什么拥有一个值得信赖的合作伙伴参与REC市场很重要？

- 大多数国家在自愿市场中并没有法规机制来定义可再生能源证书（RECs）及其用户。
- 可靠的合作伙伴只使用合法的注册机构，对可再生能源证书的发行和注销进行账目记录核对。
- 避免虚假声称产生绿证或重复销售，破坏买方的信任。
- 通过媒体、审计师和报告标准提供可持续性声明的充分证明。
- 利用国际市场的最佳价值，而不仅仅是国内市场。

消费电子公司案例研究

1. Scope

This document sets forth the specifications applicable to the use of clean energy in connection with the manufacture of [redacted] products, and goods for use therein, by you and your subsidiaries and affiliates ("Supplier").

2. Clean Energy Commitment

Supplier hereby commits to consume, develop, invest in, and procure electrical power from Clean Energy Sources (defined in the side column) equal to 100% of the electrical power used in connection with its global manufacturing operations related to [redacted] products (and goods for use therein). As an initial step towards achieving this commitment, Supplier shall provide to [redacted] on an annual basis or upon [redacted] request, Supplier's clean energy plan to satisfy this commitment.

3.Timing

Supplier shall satisfy its commitment above as soon as possible, but not later than the dates in the below table:

Country or Region of your manufacturing operations	Date
USA/Europe/China/India/ Philippines/Brazil	December 31, 2022
Japan/Korea	December 31, 2023
Rest of World	December 31, 2024
Any later date that is within 12 months from the start of manufacturing in the applicable jurisdiction above.	

Supplier will maintain this commitment for all future periods thereafter.

Attachment A

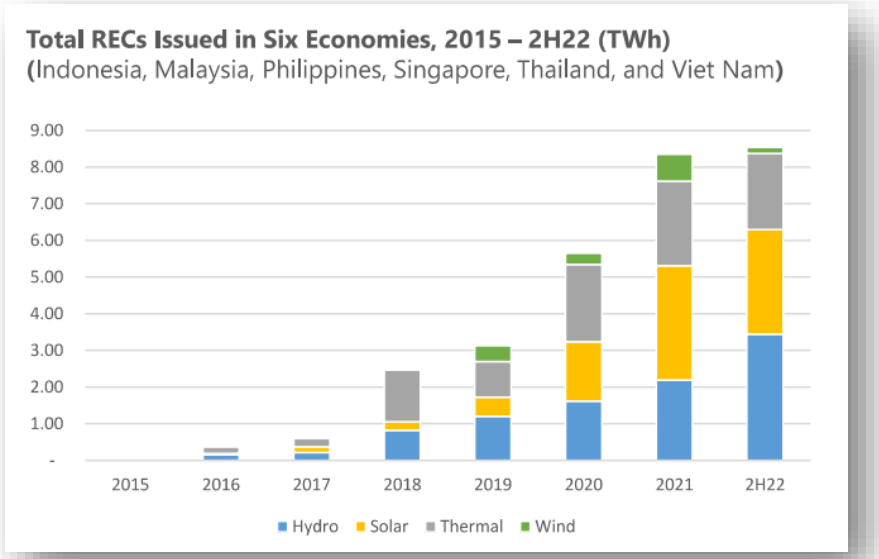
The following provides an overview of the types of renewable energy certificates and credits that are accepted by [redacted]'s Clean Energy Program to verify environmental attribute ownership. **For any certificate/credit not listed below, please contact [redacted]'s Clean Energy Program prior to obtaining the certificate/credit as it may not qualify for our program.**

Renewable energy certificates or credits represent the environmental benefits (but not the underlying electricity) associated with one megawatt-hour (MWh) or one kilowatt-hour (kWh) of clean energy that is generated from qualifying projects. Aside from serving as a measurement and verification tool, the purchase of renewable energy certificates or credits can also contribute to the creation of new clean energy projects and the sale of renewable energy certificates or credits can serve as a direct revenue source to the clean energy project.

- 大型企业正在强制其供应链使用可再生能源
- 如果可再生能源目标没有实现，供应商将面临失去客户的风险
- REC是供应商用来满足客户要求的最常见工具。

东南亚（SEA）市场

	印度尼西亚	马来西亚	菲律宾	新加坡	泰国	越南
Types of market and certificate system	Voluntary market with REC	Voluntary market with REC	Voluntary market with REC	Voluntary market with REC	Voluntary market with REC	Voluntary market with REC
Cumulative registered RE capacity (2H22)	1.5 GW	2.3 GW	1.4 MW	0.8 GW	3.9 GW	2.9 GW
Cumulative RECs issued (2015-2H22)	4.3 TWh	4.0 TWh	6.3 TWh	1.2 TWh	6.5 TWh	6.8 TWh



资料来源：I-REC、TIGR、APERC

- 东南亚的REC市场始于2015年，随着企业买家的需求而快速增长，并实现了可再生能源目标
- 截至 2022 年下半年，已在 6 个东南亚国家发布了 29M 张REC。
- 总安装 RE 容量的很大一部分已注册为 REC

主题1：I-REC商业生态与平台运营商

About I-REC Ecosystem and Platform Operator role

主讲人：I-REC 基金会东盟区董事，

Roble Poe Velasco-Rosenheim

Roble P. Velasco-Rosenheim

Director, Global Partnerships and APAC, I-REC Standard Foundation

Roble has a decade of experience supporting clean energy development in Asia and the Pacific. He is the Director of Global Partnerships and APAC Markets for the I-REC Standard Foundation, and a former consultant to the Asian Development Banks. Roble sits on on the Technical Advisory Group of the Science Based Targets Initiative (SBTI) and provides input to the greenhouse gas protocol review process.

Through these roles, Roble is focused on opening up new, credible, clean electricity markets—linking actors across the public and private sectors to scale up renewable energy and facilitate corporate procurement on a large scale.

Roble has supported dozens of governments and utilities to engage in REC market design around the globe. He also works with electricity producers and consumers to bring new products to market—most recently, supporting Asian utilities to deliver green tariffs and corporate PPAs. Overall, Roble is passionate about bridging public and private sector interests to support high-yield, low-carbon economic growth.

I-REC 基金会东盟区董事，Roble Poe Velasco-Rosenheim

Roble Poe Velasco – Rosenheim 先生在亚洲和太平洋地区支持清洁能源发展方面拥有十年的经验。他是I-REC标准基金会全球合作伙伴和亚太地区市场总监，曾是亚洲开发银行的顾问。他也是科学可行目标倡议（SBTI）技术咨询组的成员，并参与温室气体协议审查过程，为其提供意见。

虽身兼多职， Roble专注于开拓新的可信的清洁电力市场，将公共和私营部门的利益相关者联系起来，推动可再生能源的规模化和大规模企业采购的便利化。

Roble支持了全球各地数十个政府和公用事业机构参与可再生能源证书市场设计。他还与电力生产商和消费者合作推出新产品。近期他也在协助亚洲公用事业提供绿色电价和企业电力购买协议。

Roble热衷于搭建公共和私营部门的利益桥梁，支持高产出、低碳的经济增长。

THE INTERNATIONAL REC STANDARD

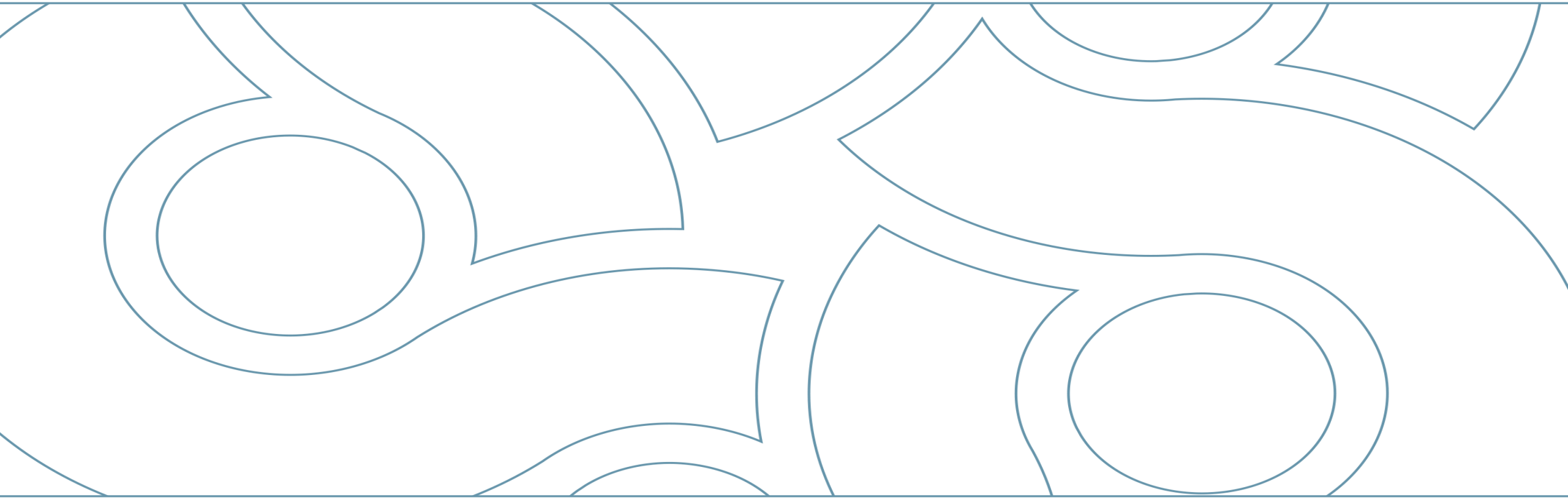
12-7-2023

Partnering Across: Countries and Instruments

Roble P. Velasco-Rosenheim
The International REC Standard Foundation

- **What we do and don’t do**
- **Partnerships and platforms**

What We Do and Don’t Do



Key Elements of REC Markets:

- **A Standard**
  - The uniform set of rules and guidelines.
- **Issuers: Central and Local**
  - The entity which "creates" RECs and facilitates the market.
- **Infrastructure: Registry**
  - The book and claim infrastructure for certificates.
- **Government and National Representatives**
  - Adherence to national law and use RECs for national objectives.
- **Market Players**
  - Buyers, sellers, **and market platforms.**

The Foundation DOES:

- Deliver a uniform instrument, tailored by partnership
  - **Set rules** (Standards) to establish global trust
  - **Tailor to local** operating context
- Bring stakeholders together
  - **Hosts dialogue** across international actors, gvt., project developers, end-users

The Foundation DOES…

- Respond to evolving market conditions
  - Update rules and implementation guidance based on:
    - Changes to international frameworks (GHGP 2, CBAM, and others)
    - "On-the-ground" realities (national updates and guidance)
- Ensure rules are implemented fairly, and uniformly
  - Partner with, and accredit implementors
  - Check in, regularly, with all parties involved

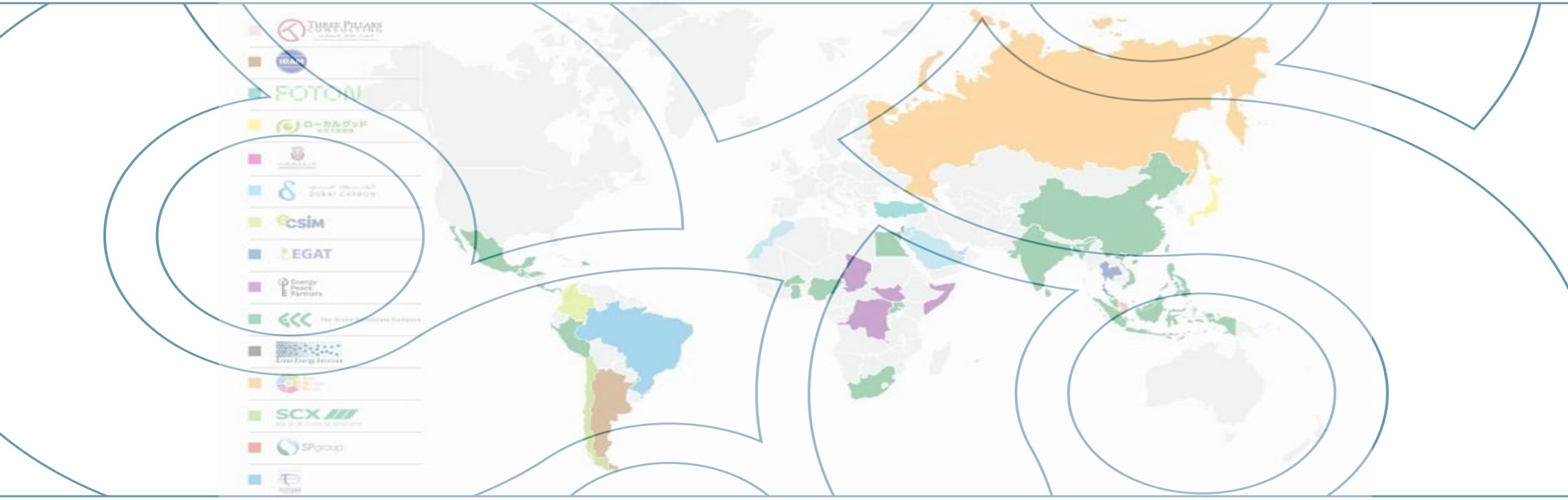
Overall, the Foundation…

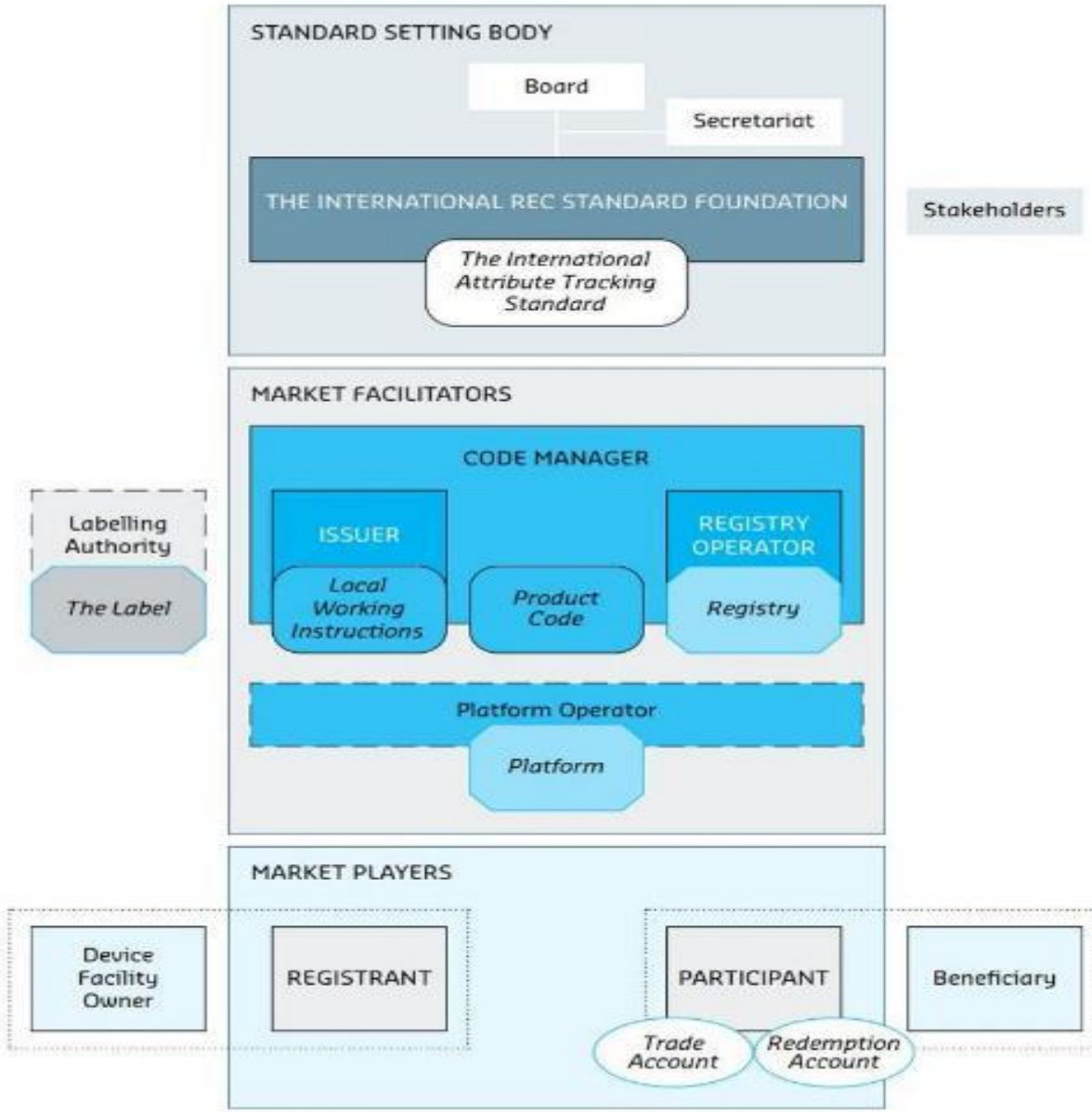
- Sets rules to guide fair markets.
- Engages stakeholders in dialogue.
- Updates rules based on national and international developments.
- Accredits entities in the ecosystem to support fair, robust, and credible markets.

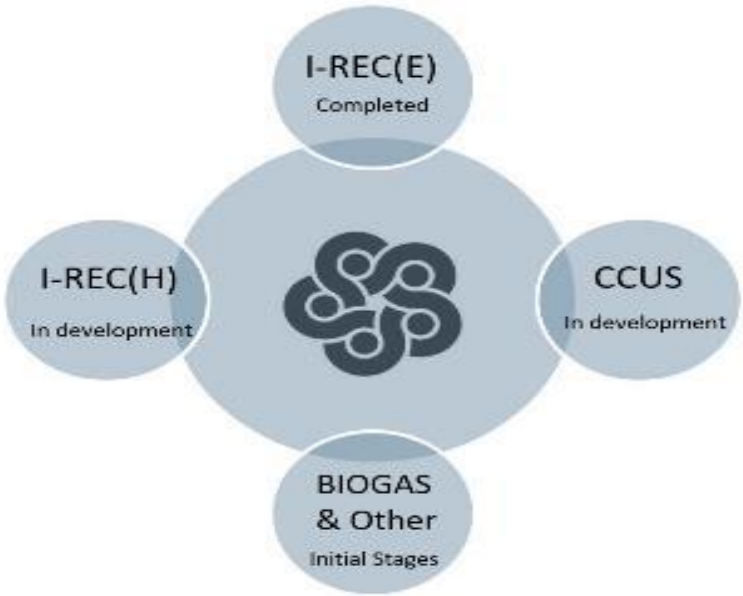
The Foundation DOES NOT…

- Implement any market instruments (!!!)
- Own or operate a registry
- Conduct verification of data or issue certificates
- Manage a platform

Partnerships and Platforms




STANDARD SETTING BODY
Board
Secretariat
THE INTERNATIONAL REC STANDARD FOUNDATION
The International Attribute Tracking Standard
Stakeholders
MARKET FACILITATORS
CODE MANAGER
ISSUER
Local Working Instructions
Product Code
REGISTRY OPERATOR
Registry
Labelling Authority
The Label
Platform Operator
Platform
MARKET PLAYERS
Device Facility Owner
REGISTRANT
PARTICIPANT
Beneficiary
Trade Account
Redemption Account


I-REC(E)
Completed
I-REC(H)
In development
CCUS
In development
BIOGAS & Other
Initial Stages


LEGEND
ORGANISATION
ENTITIES ACCREDITED BY FOUNDATION
MARKET OPTIONALS, NOT REQUIRED
DOCUMENTS
PRODUCTS ACCREDITED BY FOUNDATION
PRODUCTS APPROVED BY FOUNDATION
DOCUMENTS ACCREDITED BY FOUNDATION
TYPE OF ACCOUNT ON REGISTRY

I-REC **Market Implementation**?

I-REC **Market Implementation**?

Evident. Ev.

I-REC **Market Implementation**?

- Manage the I-REC(e) Code —> contracts
- Operate the registry
- Facilitate API integration

Evident. Ev.

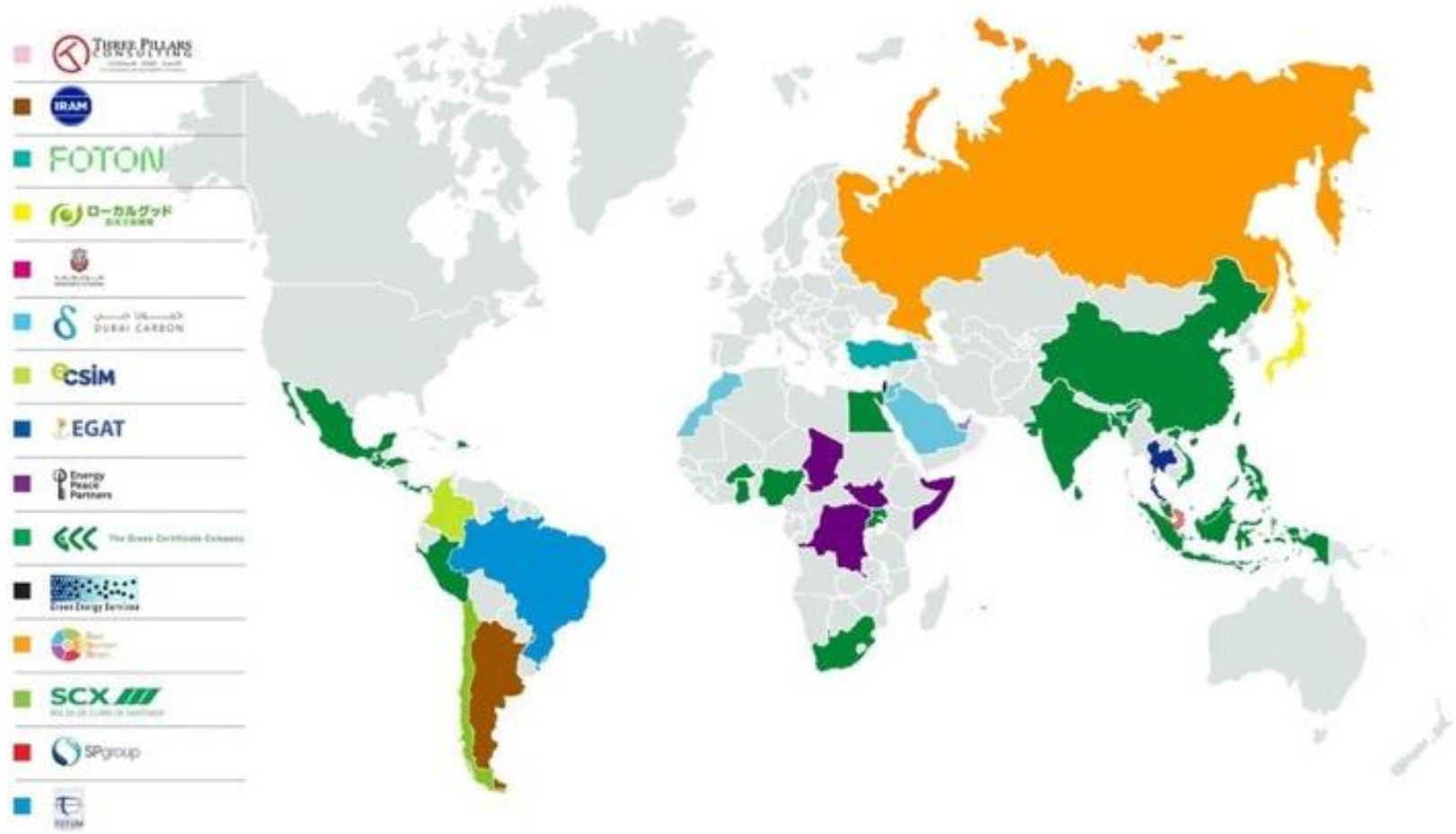
I-REC(e) certificate creation, validation, or **“Issuance”?**

The Role of an Issuer (Central or Local)

- Verify production data
- Align with national context (ownership)
- Issue the certificates

…and

Issuer Map



Now, engaging in the market...

Now, engaging in the market...

Buyers:

(13,000 businesses,
12 trillion mkt. cap.)

Sellers:

(2,000+ renewable energy developer, of any size)

Now, engaging in the market...

Buyers:

(13,000 businesses, 12 trillion mkt. cap.)

CDP
DRIVING SUSTAINABLE ECONOMIES

RE 100

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

Standard Links?

- Bilateral contracts
- Brokers/traders

Sellers:

(2,000+ renewable energy developer, of any size)

Registration Da	Role	Country Na	Region
6/30/23	Registrant	Mexico	Latin America & Caribbean
6/30/23	Registrant	Pakistan	South Asia
6/29/23	Registrant	Thailand	East Asia & Pacific
6/29/23	Registrant	Thailand	East Asia & Pacific
6/29/23	Registrant	Türkiye	Europe & Central Asia
6/29/23	Registrant	Singapore	East Asia & Pacific
6/29/23	Registrant	Türkiye	Europe & Central Asia
6/29/23	Registrant	Namibia	Sub-Saharan Africa
6/29/23	Registrant	China	East Asia & Pacific
6/29/23	Registrant	UK	Europe & Central Asia
6/29/23	Registrant	Vietnam	East Asia & Pacific
6/27/23	Registrant	Bangladesh	South Asia
6/23/23	Registrant	Pakistan	South Asia
6/22/23	Registrant	Thailand	East Asia & Pacific
6/20/23	Registrant	China	East Asia & Pacific
6/19/23	Registrant	Brazil	Latin America & Caribbean
6/19/23	Registrant	India	South Asia
6/15/23	Registrant	Türkiye	Europe & Central Asia
6/15/23	Registrant	Mexico	Latin America & Caribbean
6/15/23	Registrant	Norway	Europe & Central Asia
6/15/23	Registrant	Türkiye	Europe & Central Asia
6/15/23	Registrant	Mexico	Latin America & Caribbean
6/12/23	Registrant	Malaysia	East Asia & Pacific
6/9/23	Registrant	South Africa	Sub-Saharan Africa
6/8/23	Registrant	Thailand	East Asia & Pacific
6/8/23	Registrant	Thailand	East Asia & Pacific
6/8/23	Registrant	Thailand	East Asia & Pacific
6/6/23	Registrant	Argentina	Latin America & Caribbean
6/6/23	Registrant	Türkiye	Europe & Central Asia
6/6/23	Registrant	Japan	East Asia & Pacific
6/6/23	Registrant	Brazil	Latin America & Caribbean
6/6/23	Registrant	UK	Europe & Central Asia
6/5/23	Registrant	China	East Asia & Pacific
6/2/23	Registrant	China	East Asia & Pacific
6/2/23	Registrant	China	East Asia & Pacific
6/2/23	Registrant	Singapore	East Asia & Pacific
6/1/23	Registrant	Chile	Latin America & Caribbean
6/1/23	Registrant	China	East Asia & Pacific
6/1/23	Registrant	Chile	Latin America & Caribbean
5/31/23	Registrant	China	East Asia & Pacific
5/26/23	Registrant	Türkiye	Europe & Central Asia
5/25/23	Registrant	UK	Europe & Central Asia
5/25/23	Registrant	Mexico	Latin America & Caribbean
5/23/23	Registrant	China	East Asia & Pacific
5/23/23	Registrant	China	East Asia & Pacific
5/18/23	Registrant	Türkiye	Europe & Central Asia
5/18/23	Registrant	Türkiye	Europe & Central Asia
5/12/23	Registrant	Estonia	Europe & Central Asia
5/12/23	Registrant	China	East Asia & Pacific
5/12/23	Registrant	Türkiye	Europe & Central Asia
5/12/23	Registrant	Türkiye	Europe & Central Asia
5/5/23	Registrant	Israel	Middle East & North Africa
5/4/23	Registrant	China	East Asia & Pacific
5/4/23	Registrant	UK	Europe & Central Asia
5/4/23	Registrant	Argentina	Latin America & Caribbean
5/4/23	Registrant	China	East Asia & Pacific
5/4/23	Registrant	China	East Asia & Pacific
5/4/23	Registrant	India	South Asia
5/3/23	Registrant	India	South Asia
5/3/23	Registrant	China	East Asia & Pacific
5/3/23	Registrant	China	East Asia & Pacific
5/3/23	Registrant	UK	Europe & Central Asia

Inefficiencies?

- **Lack of price transparency is a concern for all, except traders.**
  - Reached through brokers and/or bilateral negotiation
- **Asset registration is cumbersome for small vendors.**
  - Time to register, and associated account costs
- **Matchmaking generally limited to ”manual discovery”.**
  - Only worthwhile for bulk transactions. Less so for small buyers

The Rise of Market Platforms!

- **2019, I-REC approached by "marketplace" developers**
  - API interface with registry environments
  - Central and distributed ledger (blockchain)

- **Accreditation process built into revised Standard**
  - To uphold market integrity and preserve single source of truth

REDEX

What this means for users

- **Price discovery in centralized market hubs**
  - Direct links between asset owners and end users
  - Streamlined registration creates OTC environment
- **Quality REC procurement, streamlined**
  - Quality screening filters (fuel, labels, vintage, project age)
- **National/regional authorities can manage**
  - Multiple markets and asset classes (RECs, carbon)
  - Alignment of markets with national objectives (NDCs, Net Zero)

Thank you!

Roble P. Velasco-Rosenheim

Regional Director, SE Asia
The International REC Standard Foundation

rpvelasc@irecstandard.org

主题2：跨境RECs-欧盟碳边境调节机制（CBAM）的机遇和挑战

Cross-Border REC with a focus on CBAM: Opportunities and Challenges

主讲人：I-REC 基金会执行董事，Jared Braslawsky

Jared Braslawsky
Managing Director, I-REC Standard Foundation

Jared Braslawsky is a leading expert on the use, implementation, and functionality of attribute tracking systems such as the United States REC, European Guarantee of Origin (GO), and the International REC Standard.

His expertise is used by organizations such as RE100, where he is a member of the Technical Working Group, as well as the Greenhouse Gas Protocol, and CDP. In his role as Managing Director of the I-REC Standard Foundation, he is a frequent contributor to international guidance documentation, and a regular keynote speaker at international conferences and events.

Jared played a lead role in the development and growth of the Guarantee of Origin system in Europe, through his role as Secretary-General of RECS International. More recently he co-founded the International REC Standard—a not-for-profit energy attribute tracking systems that enables the efficient implementation of reliable and globally recognized REC systems that adhere to both national renewable energy market needs and international quality criteria.

Over the years, Jared has been directly involved in developing and implementing the three most significant REC markets in the world, both in terms of international recognition and transaction volumes. He remains committed to supporting governments and the private sector as they collaborate to increase renewable installed capacity and credibly track its consumption.

主讲人：I-REC 基金会执行董事，Jared Braslawsky

Jared Braslawsky 先生 是关于美国REC、欧洲原产地保证（GO）和国际REC标准等属性追踪系统的使用、实施和功能的领先专家。

他的专业知识被RE100等组织所采用，在那里他是技术工作组的成员，同时还为温室气体协议和CDP等组织提供支持。作为I-REC标准基金会的董事总经理，他经常为国际指导文件做出贡献，并定期在国际会议和活动中担任主题演讲嘉宾。

Jared 在RECS International秘书长的职务下，在欧洲原产地保证系统的发展和增长中发挥了重要作用。近年来，他与合作伙伴共同创立了国际REC标准 (既 I-REC)。I-REC是一个非营利性能源属性追踪系统，能够高效实施可靠且被全球认可的REC系统，符合国家可再生能源市场需求和国际质量标准。

多年来， Jared 直接参与了全球三个最重要的REC市场的发展和实施，无论是在国际认可度还是交易量方面。他致力于支持政府和私营部门的合作，以增加可再生能源的装机容量，并可靠地追踪其消耗情况。

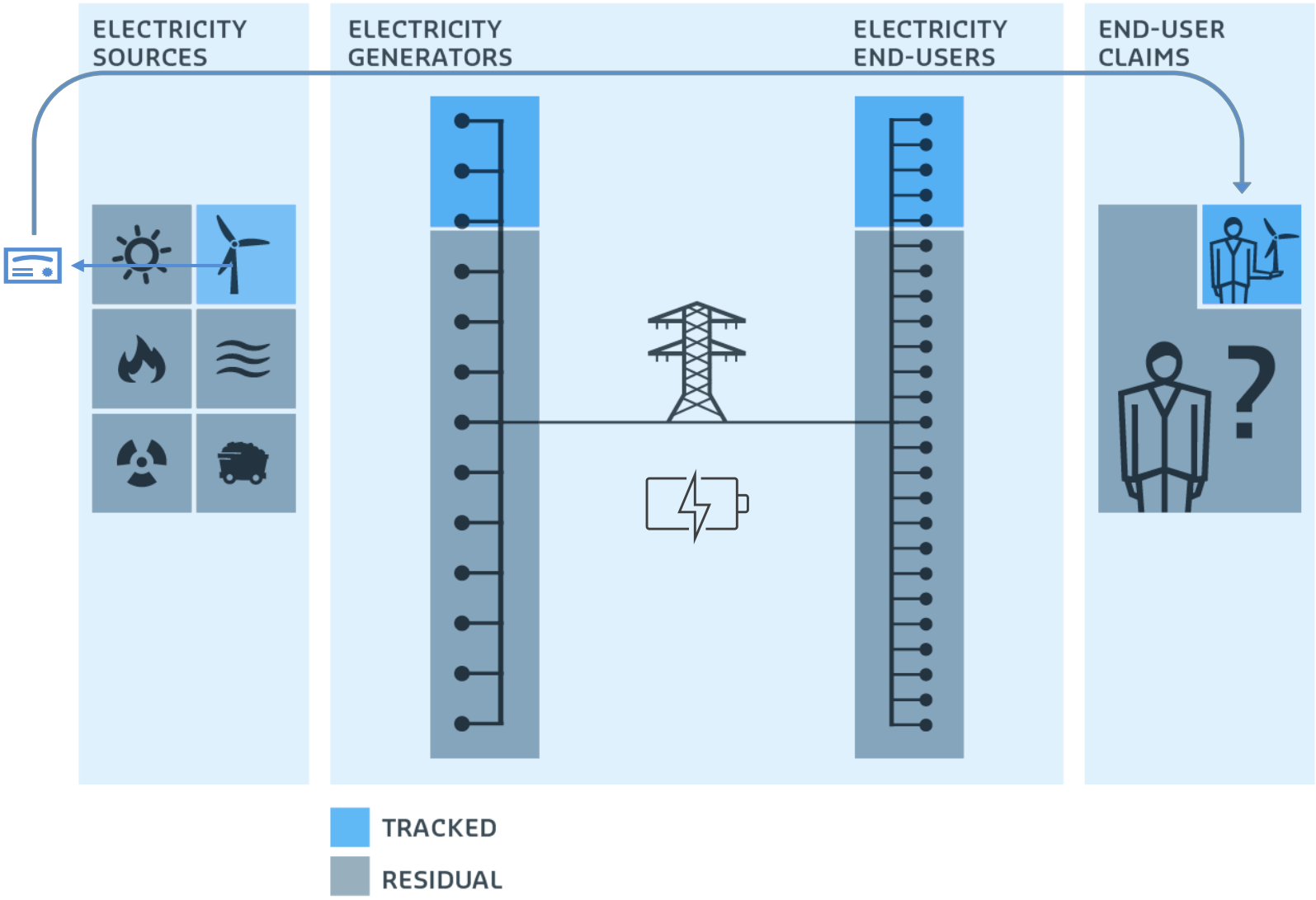
THE INTERNATIONAL REC STANDARD

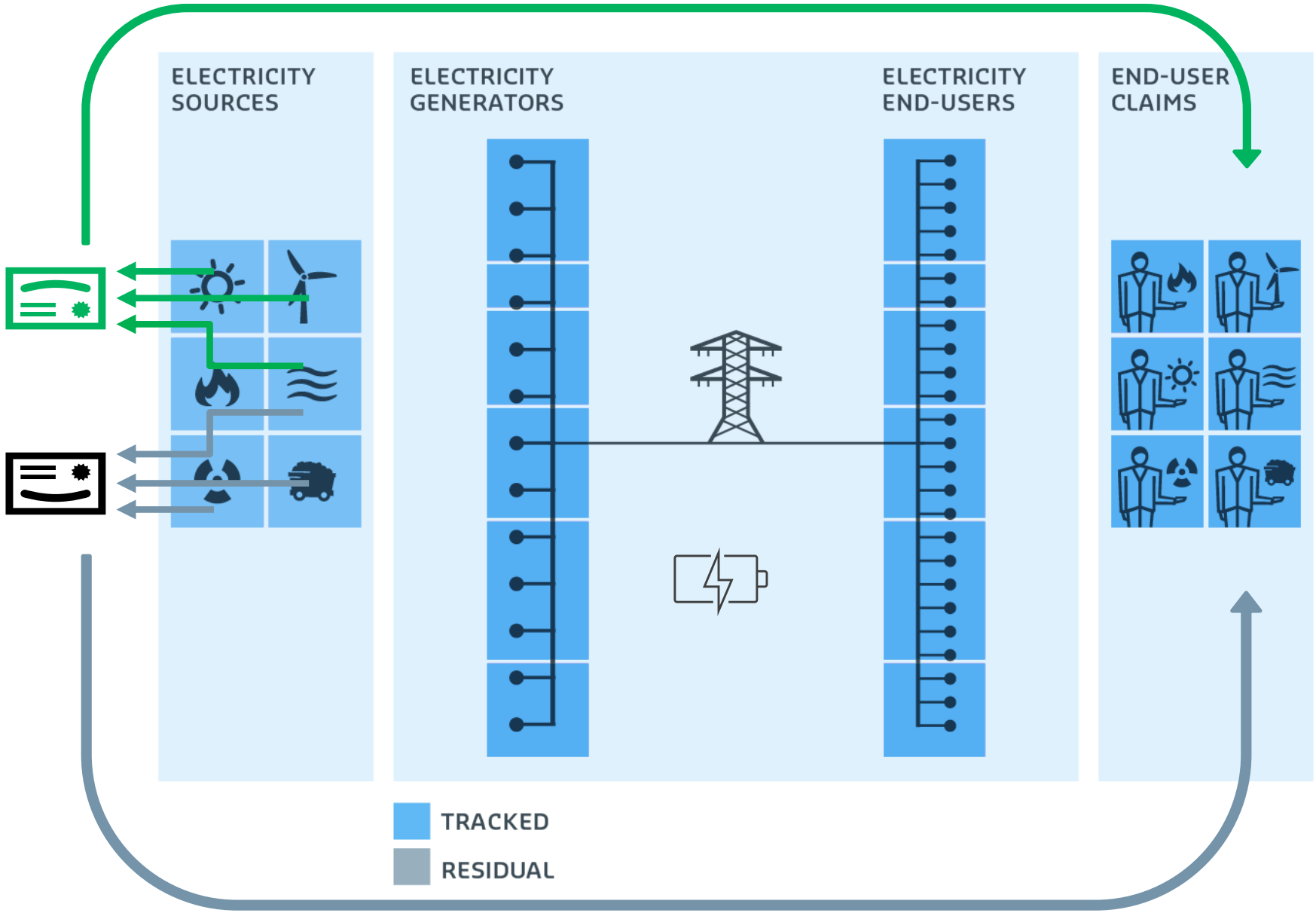
12-7-2023

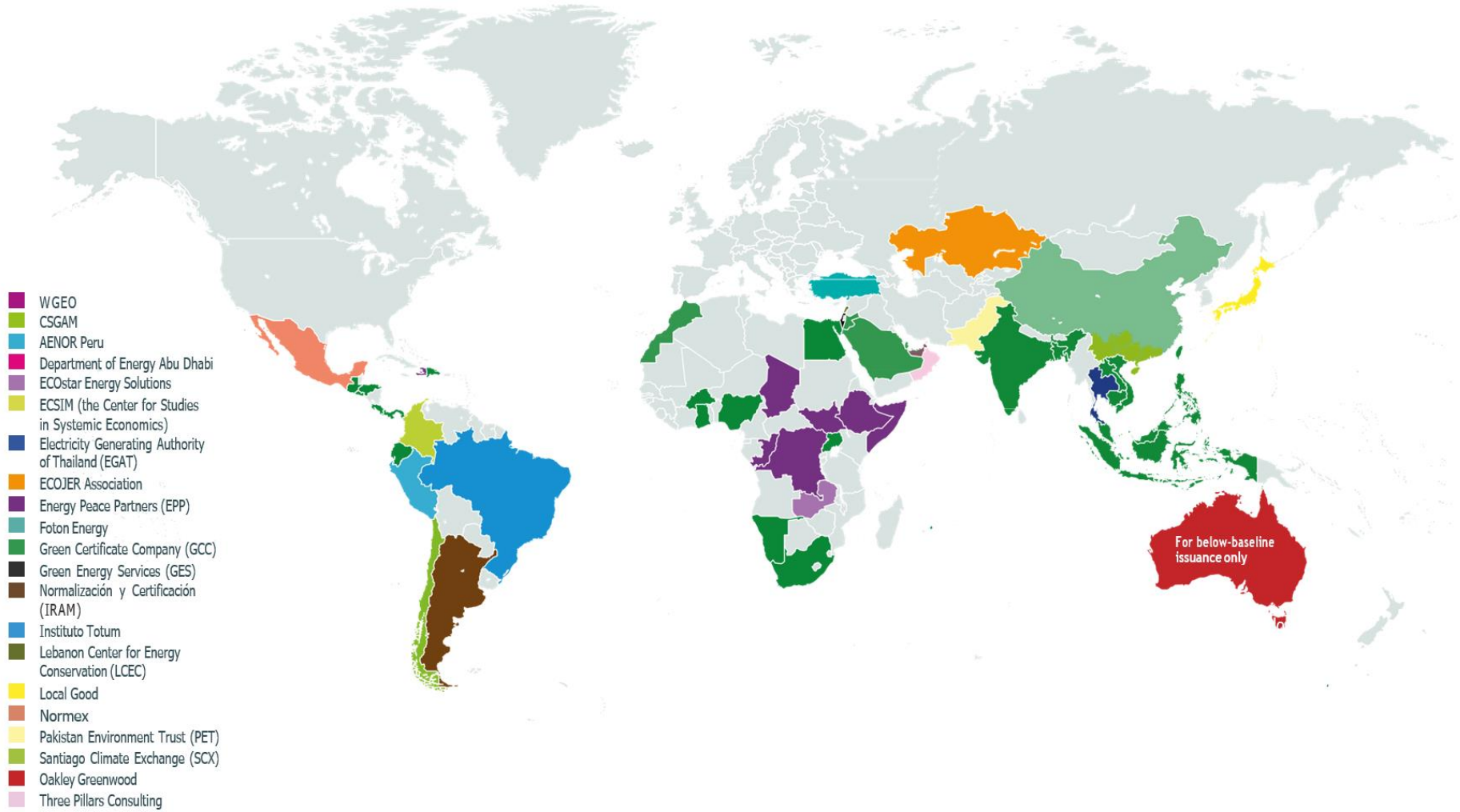
Cross-border REC and a focus on CBAM:
Opportunities and Challenges

Jared Braslawsky
I-REC Standard Foundation

EACs track embedded emissions - REC/GO/I-REC(E)




ELECTRICITY SOURCES
ELECTRICITY GENERATORS
ELECTRICITY END-USERS
END-USER CLAIMS
TRACKED
RESIDUAL


WGEO
CSGAM
AENOR Peru
Department of Energy Abu Dhabi
ECOstar Energy Solutions
ECSIM (the Center for Studies in Systemic Economics)
Electricity Generating Authority of Thailand (EGAT)
ECOJER Association
Energy Peace Partners (EPP)
Foton Energy
Green Certificate Company (GCC)
Green Energy Services (GES)
Normalización y Certificación (IRAM)
Instituto Totum
Lebanon Center for Energy Conservation (LCEC)
Local Good
Normex
Pakistan Environment Trust (PET)
Santiago Climate Exchange (SCX)
Oakley Greenwood
Three Pillars Consulting
For below-baseline issuance only

Electricity as an input into various products

Green hydrogen requires 24/7 electricity.

It is also the same principle behind green aluminium or steel.

In February 2021, Emirates Global Aluminium (EGA) announced the sale of 40,000 tonnes of their CelestiAL – aluminium produced with renewable solar power – to BMW Group.

EU Carbon Border Adjustment Mechanism Approved in May 2023

The CBAM sets a clear pathway towards mandated product emissions reporting for the numerous imported commodities outlined in Annex I, including iron, steel, cement, aluminum, fertilizers, electricity and hydrogen.

Transitional Period - 1 Oct 2023 to 31 Dec 2025

Further implementing acts by June 30 2025

CBAM-adherent commodity producers (declarants) will have the option of using either **default emissions factors** for indirect emissions (*Annex IV, point 4.3*) or applying **actual embedded emissions** if they can prove a direct physical link or **power purchase agreement (PPA)** with a renewable electricity producer for an equivalent amount of electricity used in their commodity's production (*Annex IV, point 5 and 6*).

PPA's with EACs *can* and *will* support the implementation of CBAM around the world

Embedded emissions = direct + indirect emissions

(Scope 1) *(Scope 2)*

Impacted sectors (Annex I)

*Subject to carbon pricing on **direct** emissions from 2026*

- Cement
- Fertilizers
- Iron and steel
- Electricity
- Aluminum
- Hydrogen
- Some precursors and downstream products

+ other sectors in the future

Impacted sectors (Annex II)

*Subject to carbon pricing on **direct and indirect** emissions from 2026*

- **Cement**
- **Fertilizers**

+ other sectors in the future

Two options for accounting indirect emissions (Annex IV)

Default country emission factors 1

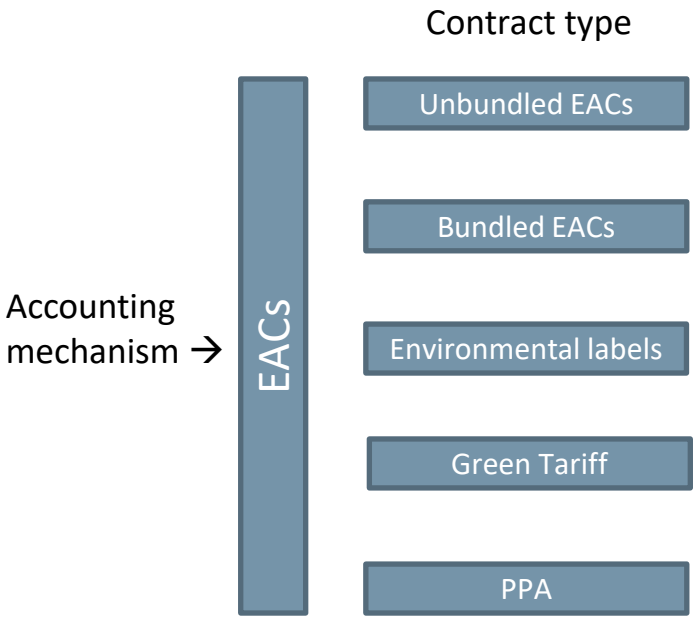
- Potentially discriminatory
- Could result in lack of WTO compliance as the only way to adhere to CBAM is to reduce entire grid, or pay taxes
- Think of the reverse for the Germany manufacturing sector versus the Norwegian sector. Do we expect all industry to move to Costa Rica?

Actual emissions reporting 2

- Involves direct connection (behind-the-meter) renewables or proof of PPAs.
- This is the only workable option as it recognizes individual procurement and empowers business decarbonization
- Recognizes that users of energy can make decisions that impact the world!

Noting that further guidance will come from the European Commission in subsequent implementing acts (pursuant to Clause 7(7))

What will PPA's look like in practice around the world?



In practice, we believe the Commission's definition of PPA (Annex IV point 1(f)) will be interpreted broadly to include any **contractually defined emissions ownership agreements** between energy producers and users. It is useful to note that the term 'PPA' is not always applied consistently across the world.

All PPAs rely on **energy attribute certificates (EACs) to provide their renewable claims. These EACs provide the basis of the contractually defined emission ownership required by CBAM and can be utilized to support the implementation of the CBAM.**

Thank you

Jared Braslawsky | Managing Director

The International REC Standard Foundation

secretariat@irecstandard.org

主题3：使用REDEX RECs数字产品解决方案

Leveraging value of REDEX's RECs Digital Solutions

主讲人：REDEX 欣耀首席运营官，李志荣

Trace, Trade, Trust
www.redex.eco

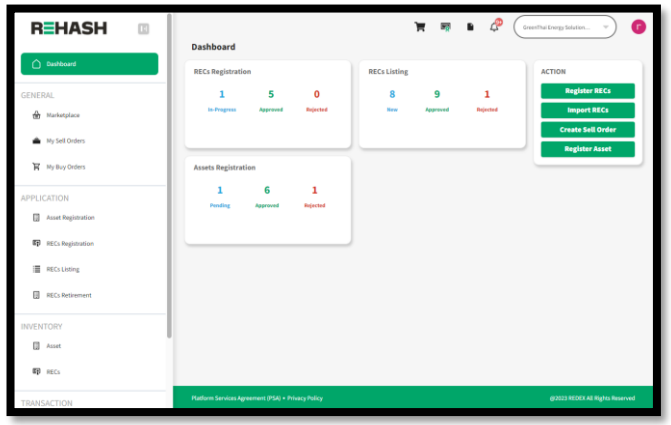
主讲人：REDEX 欣耀首席运营官，李志荣

李志荣先生 是REDEX的首席运营官，该公司致力于通过向客户提供可持续数字能源解决方案来促进二氧化碳排放范围二（Scope 2）的减少。他负责REDEX可再生能源证书（REC）服务平台的数字解决方案产品管理和运营工作。

志荣在信息技术领域方面拥有超过20年的经验，涵盖了可再生能源、银行、航空、电子和国防等行业的经验。他在美国康奈尔大学获得了工程学士和硕士学位，并在新加坡国立大学获得工商管理硕士学位。

REDEX产品

可再生能源证书（RECs）的服务平台
I-REC注册处



最经济的分布式光伏
发电设备注册

可再生能源目标设置以及追踪
购买可信任的国际绿证

REHASH

Trade RECs

Corporates & Brokers now have the easiest and most efficient platform to trace and trade Renewable Energy Certificates (RECs)

RECONNECT

Sell Home Generated RECs

For all the kWh of green energy generated at home, you can now sell renewable energy certificates (RECs) on our platform

RESUITE

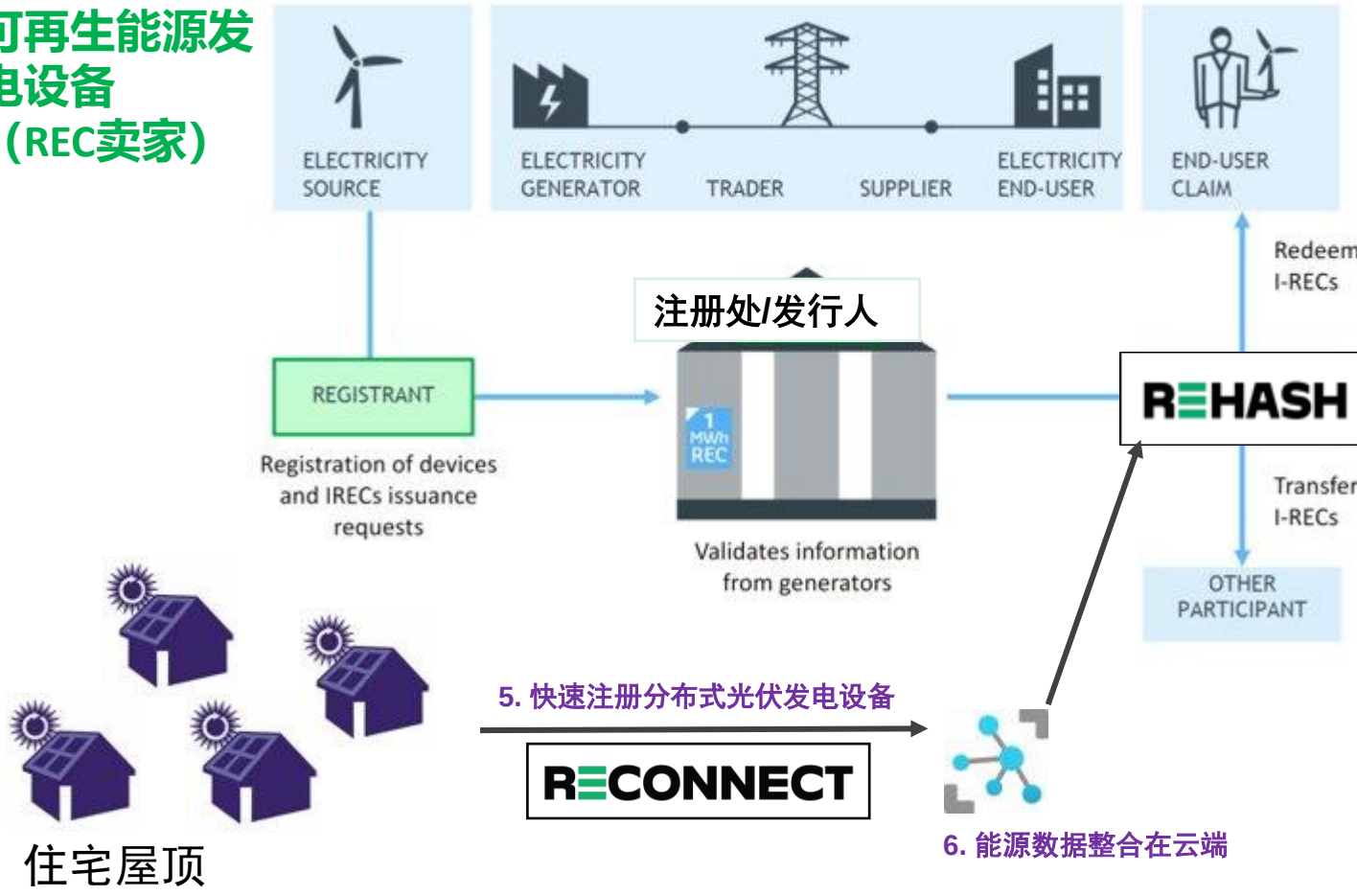
Manage Renewable Goals

Now you can monitor and manage the renewable energy goals of your business and your entire supply chain on our platform

打通绿证生态系统

REDEX

可再生能源发电设备
（REC卖家）



供应链厂商

RE100 标准

RESUITE

7. 设定可再生能源目标
8. 购买 REC 以实现目标

用电设施

1. 发电设备注册

2. REC发行请求

3. 合同管理
   - 买家
   - 卖家

4. 注销REC

流程概览

REDEX

当今唯一的一站式解决方案

发电设备验证 → 注册 → 发电数据 → REC 发行 → 买卖合同管理 → 注销

- 合法登记处
- 合格验证方
- 无需平台开户费

- 数字数据收集
- 缩短处理时间

- 价格信息发布
- 平台服务
- 注销证明

核心业务运营流程

REDEX

01

设备注册

- KYC / AML
- 文档提交
- 文件验证
- 译本
- 设备注册到注册处

01

02

绿证签发

- 从客户端获取生成数据
- 发电数据验证
- 在注册处上执行 REC 颁发请求

02

03

绿证买卖合同管理

- 购买/出售 REC
- 计费
- REC的转让

03

04

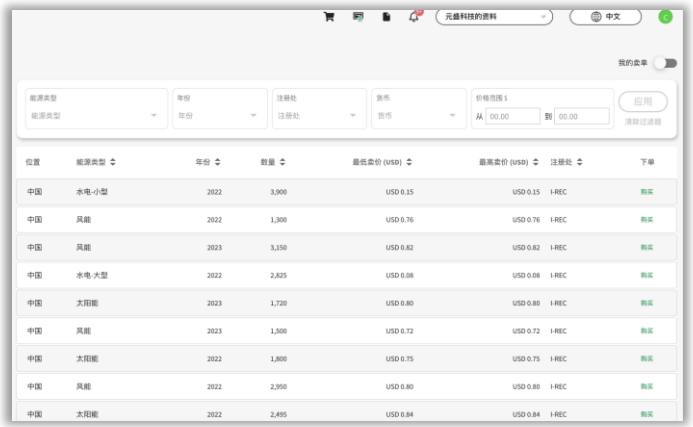
注销绿证

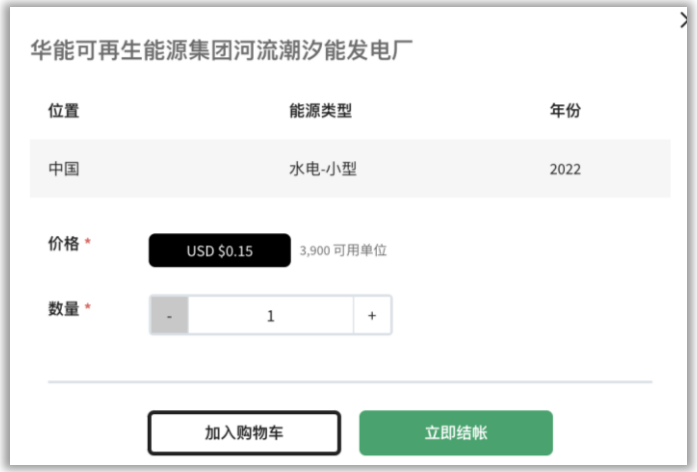
- REC 注销
- 证书处理

04

绿证价格信息

价格信息 → 卖方 → 买方





将买家和卖家与基本的 REC 信息和价格联系起来

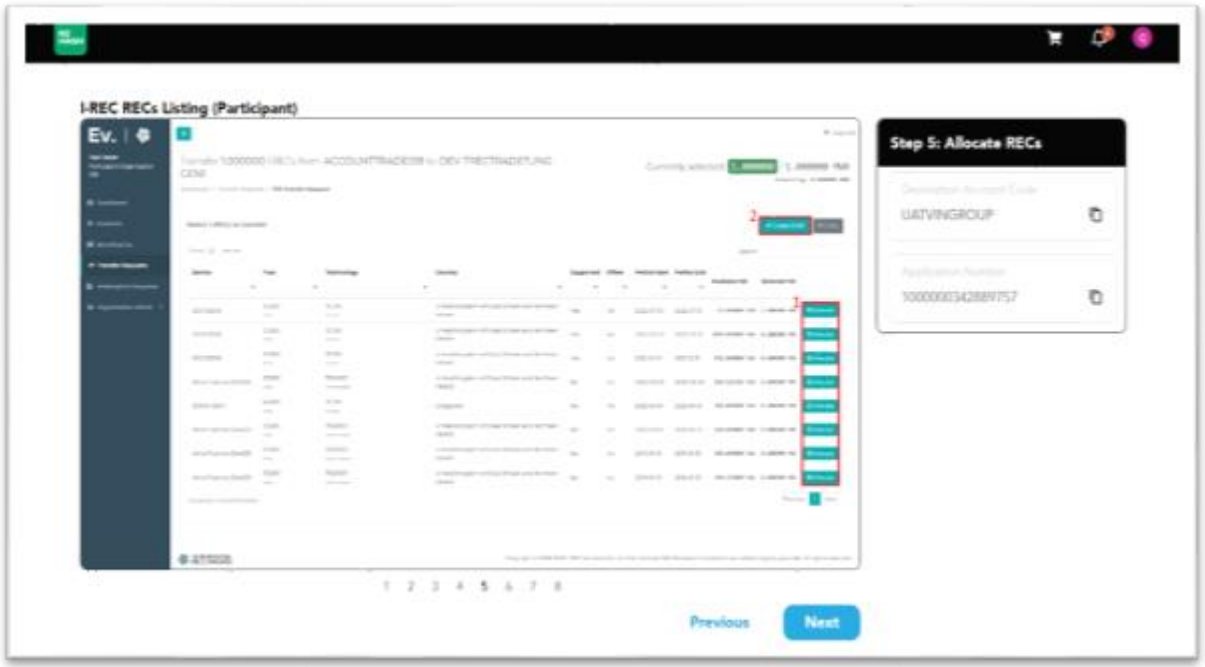
卖方可以灵活地从库存中选择在数量和价格方面出售的 REC 类型

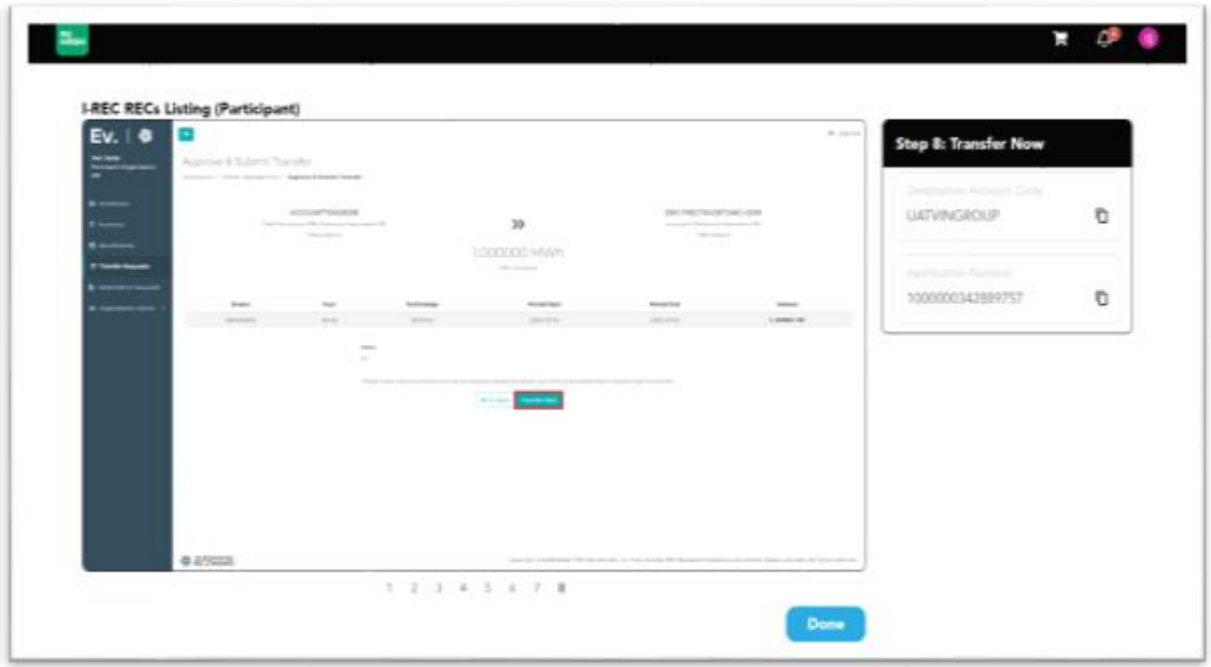
买方可以灵活地选择感兴趣的设备可用的数量和价格，并参考REC识别号

与 I-REC 注册处的 API 集成

伙伴 关系

- I-REC 上的市场帐户
- 生成器可以无缝选择将其 REC 直接发布到 REHash，从而节省注册费并从我们现成的买家中获得最优惠的价格和流动性
- 访问整个全球I-REC库存，缓解我们目前在RECs供应方面的瓶颈





设备注册

常规 > 技术 > 位置 > 支持文档

客户输入他们的设备的名称

填写发电厂的发电类型和容量

位置允许验证员在卫星地图验证实体的发电设备

支持文件有助于建立发电设备的绿色权利和所有权

发电数据的数据收集

- 各个发电企业的数字化程度不同。
- REDEX 提供各种解决方案来满足数据采集并提高运营效率。

提供者：

最佳选择

API 接口集成

- 对云服务的 API 调用。
- 例如逆变器供应商、电网运营商（如南方电网）或发电企业自己的云平台

Microsoft Power Automate

网页抓取的云服务

- 通过 RPA（机器人流程自动化）进行网页抓取
- 经客户授权

Microsoft Power Automate

最普遍

发票（最普遍）

- 通过 AI 云服务进行发票识别
- 使用特定和通用发票格式训练的 AI 模型

Azure Form Recognizer

AI Builder

无数据集成

- 可部署物联网数据记录器（合作伙伴方）。
- 常见于住宅屋顶光伏

Azure IoT Hub

RENEWABLE ENERGY CERTIFICATE

REDEX

This certificate congratulates

COMPANY NAME

on consuming renewable energy in the total sum of

5,000 MWh

Scan the QR Code for more details on the Renewable Asset

Renewable Source

Viet Nam Renewable Energy (Solar)

Registry	Vintage Year	Country	Fuel Type	Date of Claim
I-REC	2022	Vietnam	Solar	12 Apr 2023

Serial Number(s)

0000-0003-1568-9002.000000 to 0000-0003-1569-0321.004999

Redemption Purpose

The certificates are proof of claims for Scope 2 Emissions according to sustainability reporting standards

SAMPLE

I-REC Redemption Statement Verification Key:

1 2 3 4 5 6 7 8

REDEX empowers corporates and individuals to demonstrate their commitment to fighting global climate change. Supporting sustainable and renewable energy sources through the purchase of Renewable Energy Certificates (RECs) on our reliable platform powered by block-chain technology and artificial intelligence.

This is a computer-generated document. No signature is required.

THE INTERNATIONAL
REC STANDARD

Empowering Electricity Purchasers

Date: 25 May 2023
Subject: Accreditation Platform REDEX Pte. Ltd

Dear REDEX representative,

This letter is a notification that the I-REC Standard Foundation (I-REC Standard) has now Accredited your Platform 'REHash'. This notification is in line with clause twenty-one (21) of the signed Platform Operator agreement.

REDEX Pte. Ltd is now permitted to use the name and logo of the I-REC Standard Foundation and refer to REHash as an Accredited Market Platform for the services described in the REDEX Platform Report, which will be publicly available on the I-REC Standard website.

Note that the requirements for Accreditation are ongoing. As a result, the I-REC Standard Foundation will periodically check if adherence to Accreditation requirements is met and retains the right to revoke Accreditation in line with the rules of the International Attribute Tracking Standard and signed agreements.

Any questions or comments can be sent to the I-REC Standard Foundation secretariat at secretariat@irecstandard.org.

The International REC Standard Foundation
Secretariat

Jared Braslawsky
Managing Director

I-REC
STANDARD

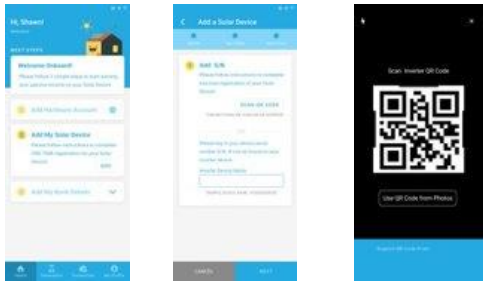
REDEX

REConnect – 载入住宅太阳能发电设备

GET IT ON Google Play

Download on the App Store

屋顶太阳能用户下载并安装应用程序，享受无缝体验的产品



扫描您的逆变器二维码以加入

CASH REWARD
Receive SGD $30 on annual basis for every 1 kWp registered with the app.

INTEGRATED DATA
Reducing recurring manual processes to zero, by integrating to your cloud data, accumulating with precision.

EASY PROCESS
Only requires one time action from you to start enjoying the benefit, leave the rest to us.

ONGOING SUPPORT
We will provide end-to-end support on queries regarding the service.

- 一款支持DIY发电设施注册和REC验证的移动应用程序，针对住宅屋顶太阳能发电设备
- 简化流程（与 REC 注册管理机构保持一致），以缩短入职流程并免除前期费用

益处

为什么?

更快的投资回报

- ❑ 电网节省的额外奖励
- ❑ 更快地收回投资

成本降低者

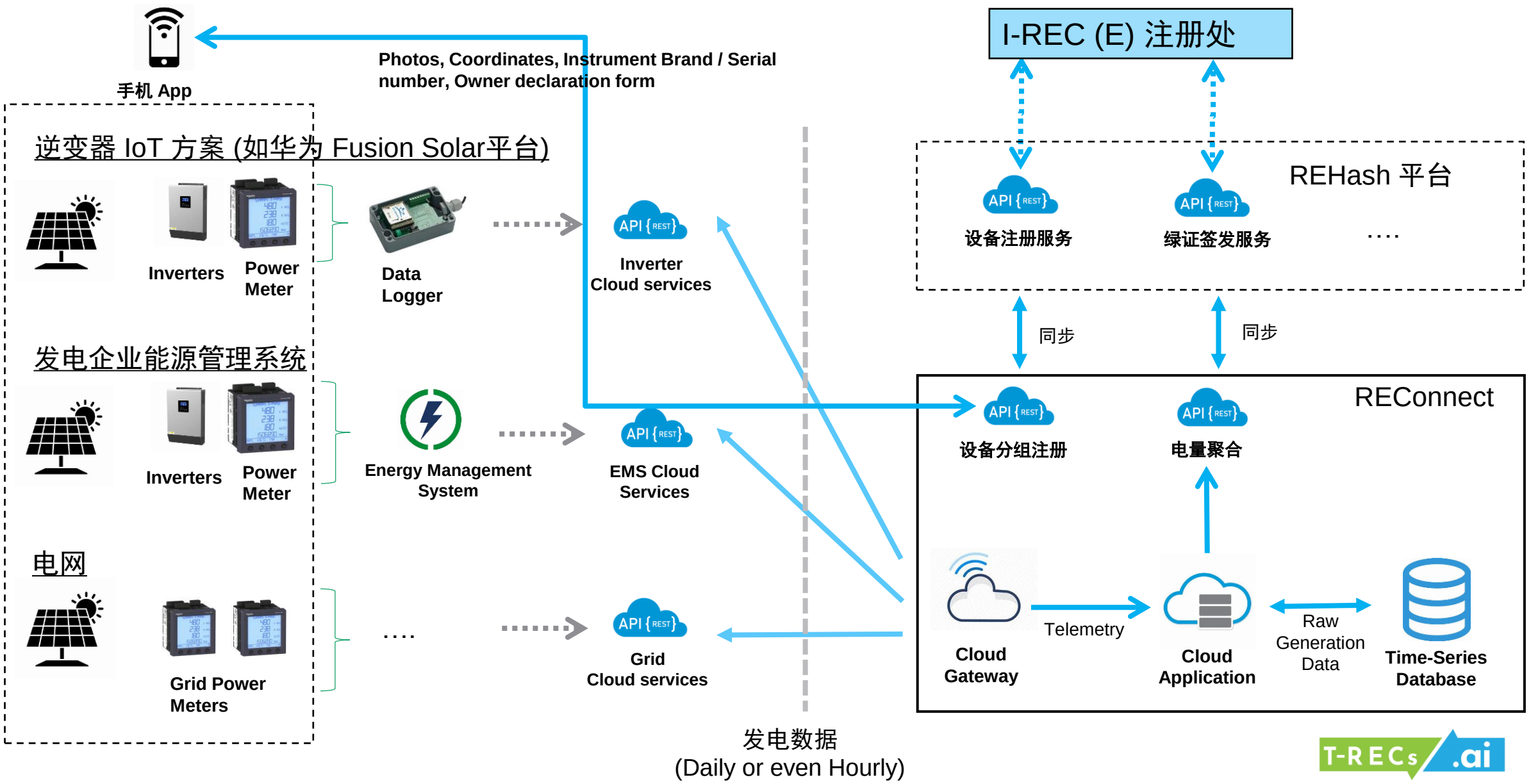
- ❑ 减少维护费用
- ❑ 以换新换取更好的表现

环境

- ❑ 采用清洁能源的动力更强
- ❑ 最少的个人努力

增加家庭参与

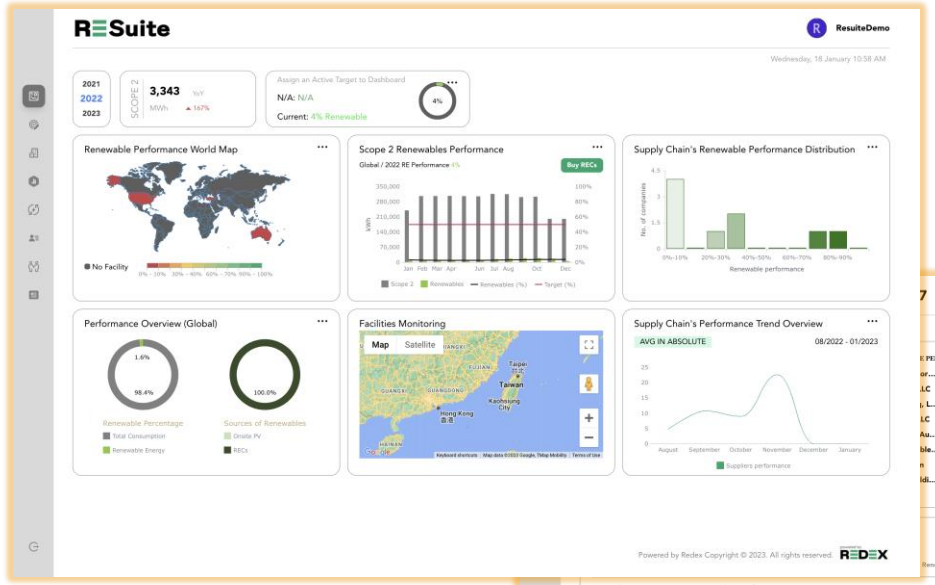
REConnect – 设计架构

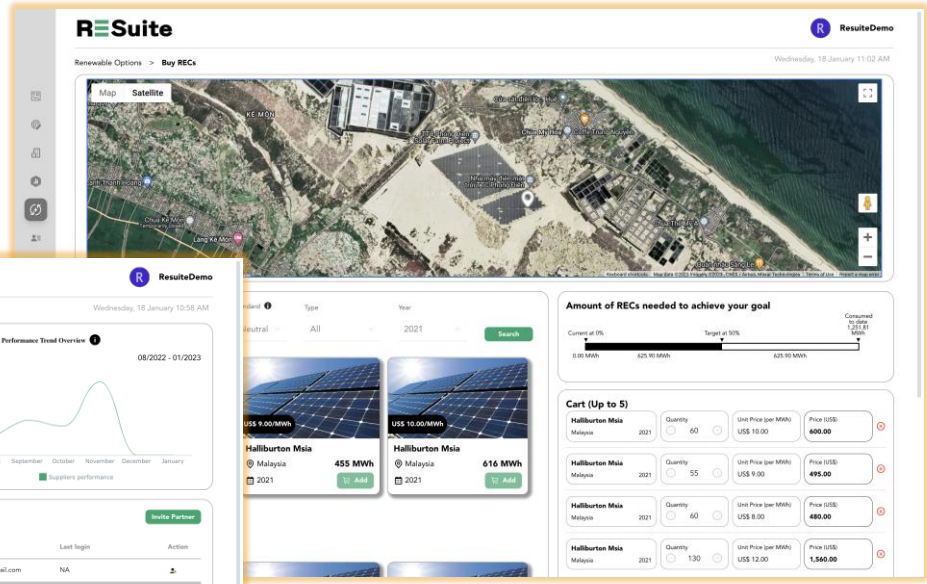


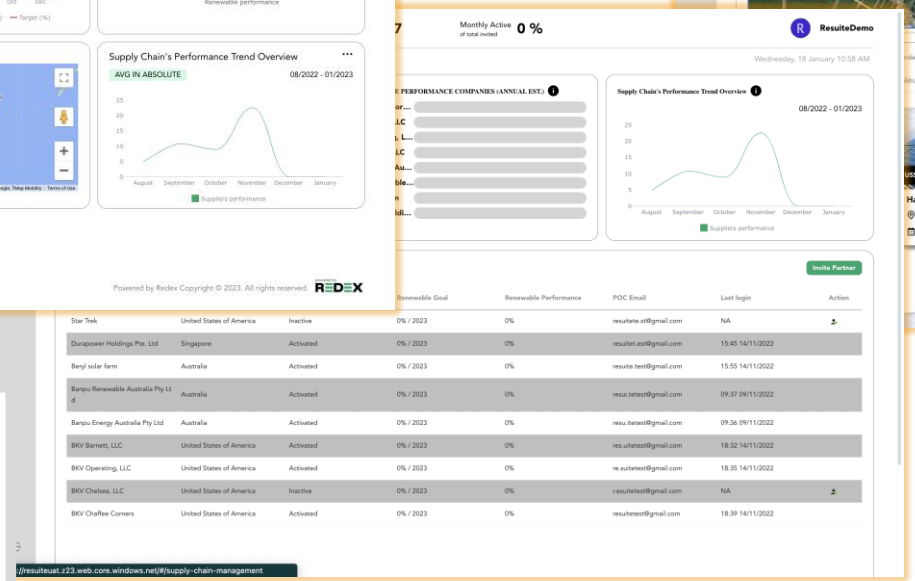
RESuite：设置及追踪可再生能源目标

独特的知识产权和技术

- 公司跟踪自身及其供应链的范围2 碳排放
- 根据数据计算绿证需求，进而购买可信任的国际绿证（与REHash平台整合）







- 也可与各个已有的 碳追踪平台 合作，提供绿证购买API，从而引导到REHash平台上

主题5：
分布式光伏可再生能源证书开发现状和思考

Maximising Returns on Investment Through RECs: Perspective from Distributed Solar PV System Owners

主讲人：天合富家能源股份有限公司经理，于佳

主讲人：天合富家能源股份有限公司经理，于佳

于佳先生在电力行业工作多年，曾在东北电力调控中心担任调度工作，对电力系统运行有着深入的认识。通过这段经历，他亲身经历了拉闸限电等问题，深刻认识到新能源的高比例增加将对电力系统带来全面的变革。这个意识推动着他积极探索和应对电力行业面临的新挑战。

于佳先生在2022年加入了天合富家能源股份有限公司，从事与RECs开发相关的工作。他以推动可再生能源的发展为己任，专注于开发和推广RECs，促进可再生能源的利用和市场化。他的努力使得天合富家能源股份有限公司在新能源领域取得了显著的成绩，并为电力行业的转型注入了新的活力，也为环境保护和能源可持续发展作出了重要贡献。

分布式光伏可再生能源证书开发现状和思考

2023年7月

目录

01
分布式光伏介绍

什么是分布式光伏

分布式光伏发电特指在用户场地附近建设，运行方式以用户侧自发自用、多余电量上网；它倡导就近发电，就近并网，就近转换，就近使用的原则。分布式光伏分为户用和工商业分布式两大类型。

户用分布式光伏

工商业分布式光伏

分布式光伏发电原理

利用光伏组件的光电转换效应，把太阳光转换成直流电，经过光伏逆变器把直流电转换成普遍使用的交流电，通过控制设备供给就近的设备或电器使用,或者直接上传国家电网。

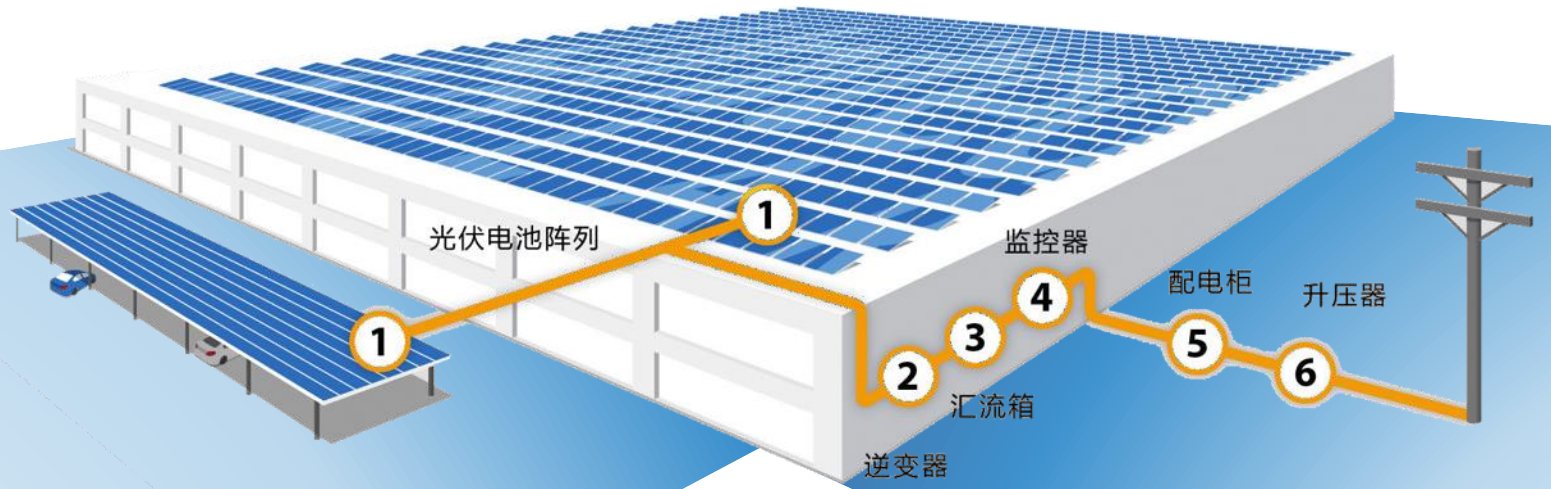
分布式光伏 | 分布式已成为光伏发展的趋势与潮流

2014-2022年全国光伏新增装机量（GW）

分布式光伏新增容量占比不断攀升，2022年同比增长74.5%，

数据来源：国家能源局2014-2022年《光伏发电并网运行情况》

分布式光伏 | 分布式光伏特点



投资收益高
内部收益率15%-20%

传输损耗低
近场消纳，传输距离短，线损低

电网冲击小
靠近负荷中心，规模小，
对电网频率、电压波动影响小

管理难度大
分布广，类型多，难以统一管理

体现绿色发展
利用闲置屋顶，无需占用连片土地
不占用公共资源

分布式光伏 | 工商业收益举例测算

以山东某地业主现款自投2MW项目为例，使用电金刚PRO 500W原装系统


装机量
2,000千瓦


年有效光照
1,100小时


自发自用比例
90%


综合用电电价
0.72元/度

项目投入	系统单价 3.6元/瓦	电站造价 720万元	运维费用（第3年开始） 10万元/年
发电量测算	年均发电量 195万度	25年发电量 4,880万度	
收益测算	年均发电收益（节电+上网） 134.2万元	25年发电收益（节电+上网） 3,355万元	25年净收益 2,405万元
投资回报率	回本周期 约4.9年	IRR 18%	

▶ 全生命周期收益比普通系统多10%

项目实际收益与当地气候、光照条件、屋顶条件、企业用电曲线、电价等多个因素有关，以上收益测算仅供参考。

天合蓝天 | 原装工商业光伏系统

天合富家旗下面向工商业市场的子品牌，为合作伙伴打造最具持续盈利能力的分布式创业平台，为消费者提供定制化原装工商业光伏系统解决方案。

应用场景解决方案

应用场景解决方案持续更新迭代……

业务模式

现款模式
企业自持电站

金融模式
企业自持电站

EMC模式
第三方持有电站

EMCT模式
合约能源合同管理

具体详情请咨询相关区域业务经理

天合富家 | 多元化业务模式

	全款购	兴业光伏贷	租电赞	惠农宝	租屋顶
备案、并网主体	自然人	自然人	自然人	自然人	非自然人（项目公司）
适合客群	资金充裕，了解光伏 希望获得最高收益	不愿出资，接受贷款 希望获得较高收益	不愿出资，不接受贷款 希望获得较高收益	不愿出资，不接受贷款 希望获得稳定收入	不愿出资，不接受贷款 希望获得稳定收入
用户初期投入	高	无首付	无资金投入	无资金投入	无资金投入
业务模式	全款	贷款（上征信）	经营性租赁（不上征信）	合作共建	租赁屋顶
协议年限	-	15年	18/25年	25年	25年
用户收益	高	较高	较高	低	低
经销商收入来源	进销差价	市场开发与服务费	市场开发与服务费	市场开发与服务费	市场开发与服务费

多方共享价值链

天合富家战略布局

原装家用光伏系统

750,000+ 户用系统电站

原装工商业光伏系统

200+
行业深度合作

2,000+
项目经验

3,000+
项目合伙人

02

户用光伏REC开发现状与难点

户用光伏 | REC开发流程

一、项目注册阶段

提供项目真实性材料，证明项目存在且并网运行。

序号	材料名称
1	并网调度协议
2	并网调试报告
3	高压购售电合同
4	营业执照
5	电表照片
6	现场照片
7	逆变器规格
8	一次接线图
9	项目位置信息（经纬度）

二、绿证签发阶段

对已注册项目，提供发电量真实性材料，确权绿电环境权益。

电量结算单+结算发票

分布式光伏 | 工商业国际绿证开发

项

常州单体TIGR项目：单体项目，5.91MW

山东TIGR项目：7个项目组合，5.6MW

河南TIGR项目：3个项目组合，3.7MW

湘潭TIGR项目：3个光伏项目组合，4.85MW

分布式光伏 | 户用光伏系统特点

户用分布式光伏在立项建设和电费结算上的简化特性，导致户用发电的环境权益无法实现

- 户用光伏大都采用全额上网方式。
- 开发模式多，备案文件少。
- 容量小，数量巨大。
- 没有单独的电量结算单，没有发票。

分布式光伏 | 户用光伏系统国际绿证开发（I-REC/TIGR）难点：

集中式光伏电站和工商业光伏电站进行国际绿证项目注册能够提供的材料清单：

集中式/工商业分布式光伏	户用光伏
并网调度协议/购售电协议	无
指定项目一次接线图	典型项目的一次接线图
并网验收报告	竣工验收报告
营业执照	营业执照（非户主）
电量结算单	光e宝/逆变器数据
可利用卫星地图进行定位	无法利用卫星地图定位

支撑材料缺失、不标准，对项目真实性的核查造成阻碍。

分布式光伏 | 户用光伏系统国际绿证开发（I-REC/TIGR）难点：

户用光伏注册REC组合项目中：

- 户用光伏组合项目单元多，传统材料整理和核证工作量巨大。
- 容量上限不大于5MW，数量不大于50个的条件下，户用组合项目的容量在1~1.5MW左右，全部销售根据市场价格收益仅有5000~8000。

成本收益的不匹配也将提高绿证申请的阻碍。

分布式光伏 | 户用光伏系统国际绿证开发（I-REC/TIGR）难点：

- 户用光伏项目注册时，现有情形需要将涉及个人住址的信息传输至海外，形成合规风险：

- 《数据出境安全评估办法》：数据处理者向境外提供数据，有下列情形之一的，应当通过所在地省级网信部门向国家网信部门申报数据出境安全评估：
- （一）数据处理者向境外提供重要数据；
- （二）关键信息基础设施运营者和处理100万人以上个人信息的数据处理者向境外提供个人信息；
- （三）自上年1月1日起累计向境外提供10万人个人信息或者1万人敏感个人信息的数据处理者向境外提供个人信息；
- （四）国家网信部门规定的其他需要申报数据出境安全评估的情形。

03

户用光伏REC开发解决方案与展望

户用光伏 | REC开发解决方案

一、数字化监控平台能够有效的解决户用光伏REC开发中的问题：

1、海量数据的统计，整理分析能力有助于降低核证人员的工作量

2、全生命周期管理对光伏项目和发电量的真实性进行背书。

3、采用监控平台后，有利于提高组合项目的容量上限和项目内单元数量。

二、国内数据由国内机构进行管理，本地化机构核查有助解决数据出境合规问题。

户用光伏 | REC开发未来展望

- 分布式光伏的发展潜力大，增速块，RECs市场发展不可或缺的市场。
- 业务形态丰富，就地消纳的特点能够有效的降低”漂绿“的风险。
- 市场化交易+供应链减排的手段能够带动更多的中小型排放企业参与可持续发展实践，加速推动碳中和的进程
- 采用创新方式推动REC在中国乃至于东亚地区的发展。

专题讨论：
驱动中国REC需求的因素

Drivers for RECs Demand in China

4:20 PM - 4:50 PM

Trace, Trade, Trust
www.redex.eco

专题讨论：驱动中国可再生能源证书需求的因素

REDEX
中国市场董事

Liu Wei
刘伟

REDEX
创始人及首席执行官

Kang Jen Wei
甘正伟

I-REC基金会
执行董事

Jared
Braslawsky

上海晨翘智能科技有限公司
市场总监

Zhang Chengcheng
张程程

交流和茶歇

Refreshments and Networking

4:00 PM - 4:30 PM

专题讨论：
中国可再生能源证书的供应

RECs Supply in China

4:30 PM - 5:00 PM

Trace, Trade, Trust
www.redex.eco

专题讨论：中国可再生能源证书的供应

REDEX
中国市场董事

Liu Wei
刘伟

REDEX
创始人及首席执行官

Kang Jen Wei
甘正伟

天合富家能源
经理

Yu Jia
于佳

广东粤碳技术咨询
总经理

Luo Wenhao
罗文浩

青岛金碳号
总经理

David Niu
牛大卫

闭幕致辞：
中国和亚洲REC未来

Future of RECs
in China and Asia

主讲人：REDEX 欣耀创始人兼首席执行官，甘正伟

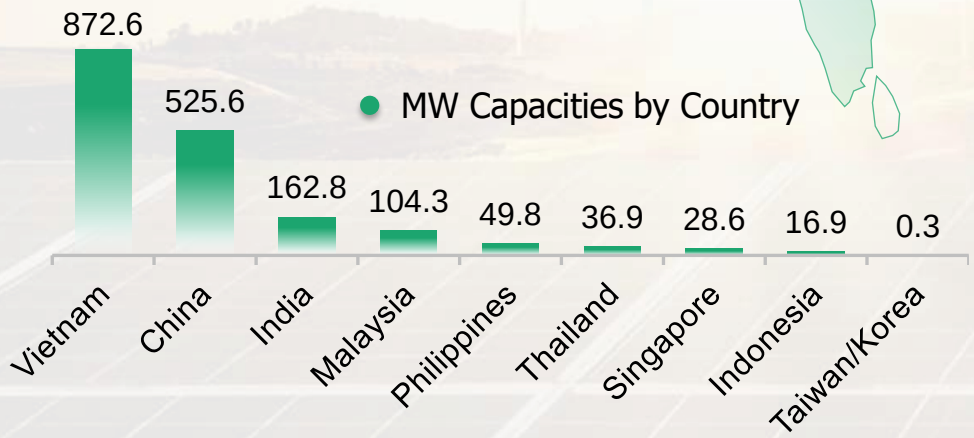
Trace, Trade, Trust
www.redex.eco

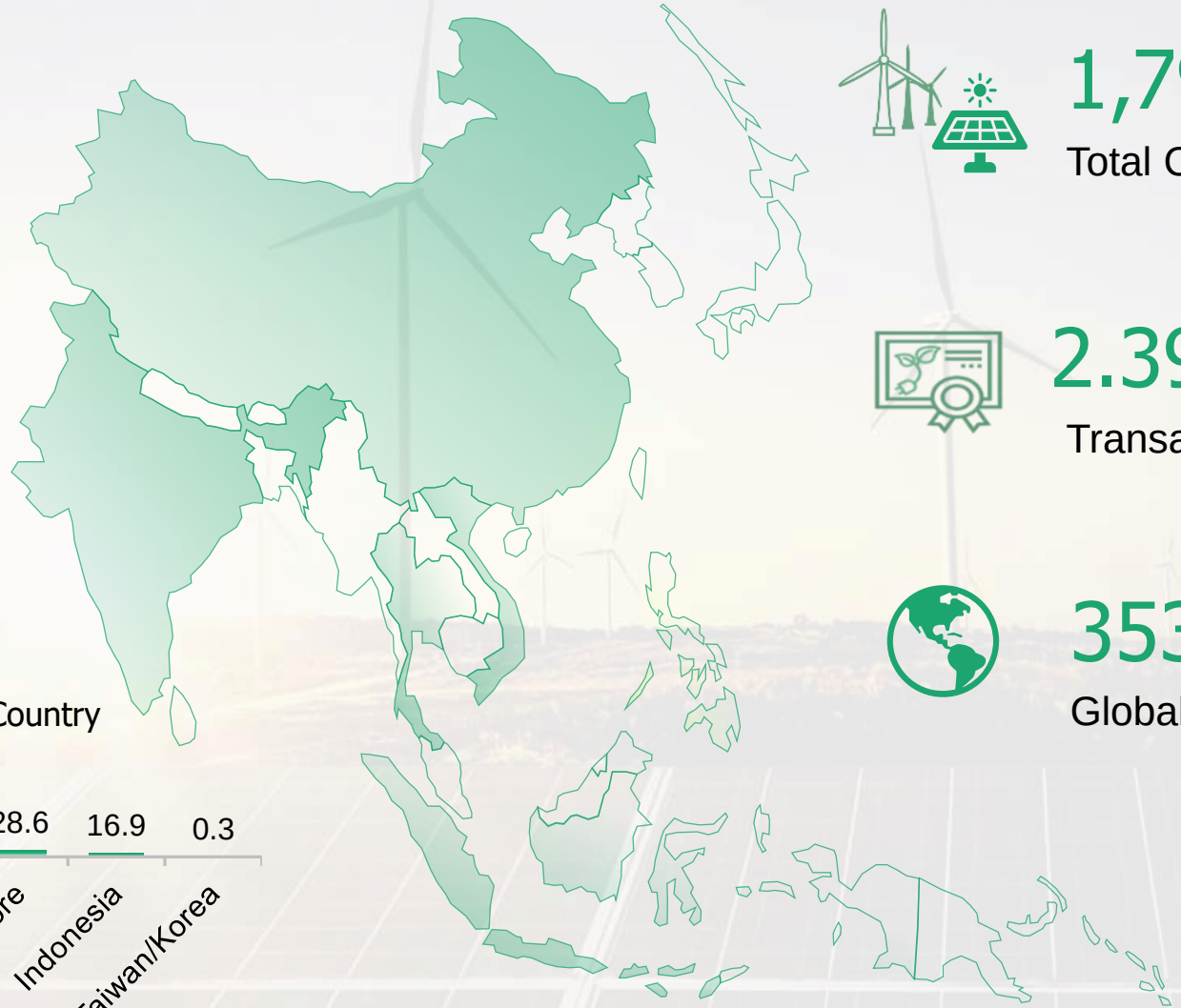
Who Are We

Since 2018

REDEX.ECO offers a full suite of services to manage Renewable Energy Certificates (RECs) through a blockchain-enabled platform REHash™

Clients can register, buy, sell and retire RECs in a digital, hassle-free manner to achieve energy sustainability goals





1,798 MW
Total Capacity

2.39M RECs
Transacted Annually

353
Global Accounts

Trace, Trade, Trust
www.redex.eco

The Journey

The Only One-Stop Solution

Asset Verification → Registration → Generation Data → REC Issuance → Transaction → Retirement

Typical 4 – 16 Weeks | Up to 1 Week | Source for Buyers

REDEX

- No Registration Fees
- Up to 4 Weeks
- Up to 1 Week
- No Issuance Fee Until Sold
- Fast Response to Buyers
- Marketplace Access

Why Us?

REDEX

Market Transparency
Full access to seller and buyer pool, including international participants

Traceability
In a real-time transacting environment, digital methods are the only possible way to keep track of all origin, consumption, and status of RECs

Digital Features
Instant marketing, new trade features, secondary revenue opportunities are all possibilities online

VS

TRADERS

Closed Transactions
Transactions are selective, offers provided may not be the best available in the market

Manual Process
Time-consuming process, lack of visibility of information and higher risk of fraud

Limited Value
Don’t be limited to pure trading and miss out on opportunities to harvest the full value of your contributions

Our Success

Power Retailers

TUAS POWER · Senoko energy · sembcorp · PacificLight · Geneco Powered by Seraya Energy

Energy Investors

GEC · CME COPPER MOUNTAIN ENERGY · TotalEnergies · Brookfield · Trinasolar · CLIMATE FUND MANAGERS · TTC · Teo Seng Capital Berhad · XUAN THIEN GROUP · SUNSEAP · NAMI ENERGY · SOLARVEST Turning Sunlight Into Investment · sinarmas · SkyX Solar · 華能國際電力股份有限公司 HUANENG POWER INTERNATIONAL, INC. · REE Solar Energy · BANPUNEXT

Solution Providers

HUAWEI · Schneider Electric · Envision · muRata INNOVATOR IN ELECTRONICS · REC · LUXSHARE ICT · SAMSUNG · SJ SURBANA JURONG

Consumers

UOB 大華銀行 · ST · MACQUARIE · GIC · BARCLAYS · CRODA · DHL · NIKE · NESTE · Takeda

REDEX is connecting the RECs Ecosystem

REDEX

Generators

Large Devices

Small Devices

Registration/Trading

THE INTERNATIONAL REC STANDARD

API-Integrated Registration

Auto RECs issuance

REHASH

RECONNECT

Buyers

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

RE 100

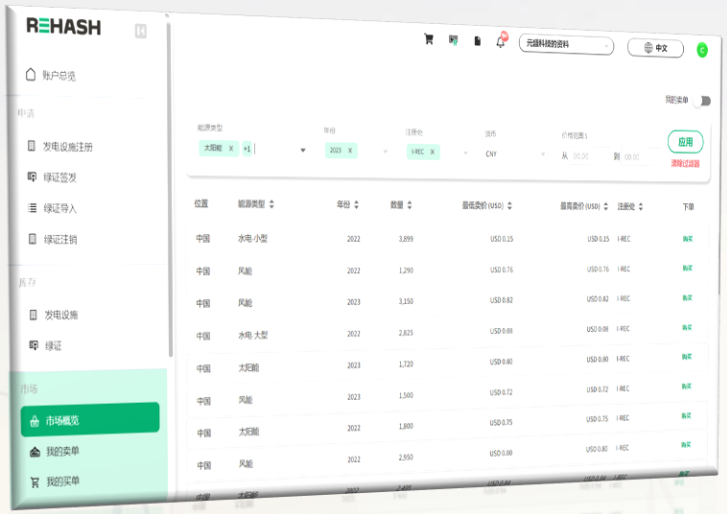
GREENHOUSE GAS PROTOCOL

Buy RECs for compliance

RESUITE

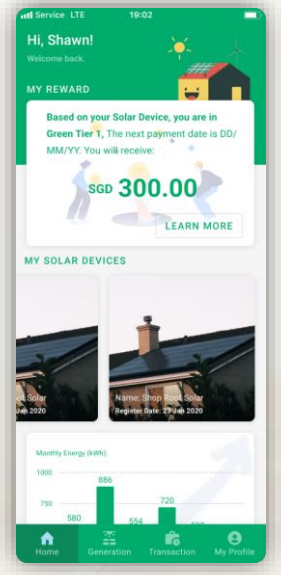
Traders
Brokers
Consultants

Our Offerings to meet your requirements



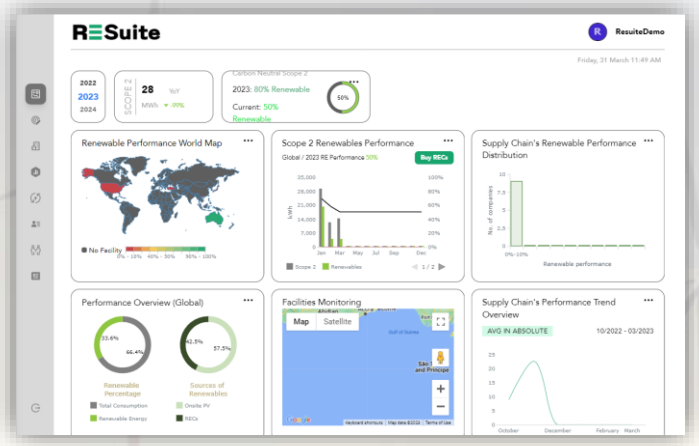
REHASH

A platform that connects all buyer, sellers and traders to a common marketplace



RECONNECT

Home and mobile users can also play a part in the trade



RESUITE

Assists the corporate user to set targets and monitor emission reductions, including vendors in supply chain

RESMART

Power optimization for use cases involving energy storage

自由交流

Networking

Trace, Trade, Trust
www.redex.eco

Thank you!

REDEX 欣耀 中国区市场董事，刘威
联系方式：
+65-89427720 （微信同号）
wei.liu@redex.eco

Trace, Trade, Trust
www.redex.eco