





# Technical Notes of Conceptual Regional REC Framework for BIMP-EAGA Countries





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## **About Us**

## About ACE

Established in 1999, the ASEAN Centre for Energy (ACE) is an intergovernmental organisation within the ASEAN structure that independently represents the interests of the 10 ASEAN countries in the energy sector. The Centre accelerates the integration of energy strategies within ASEAN by providing relevant information and expertise to ensure the necessary energy policies and programmes are in harmony with economic growth and the region's environmental sustainability. It is guided by a Governing Council composed of Senior Officials on Energy leaders from each ASEAN Member State and a representative from the ASEAN Secretariat. Hosted by Indonesia's Ministry of Energy and Mineral Resources (MEMR), the ACE's office is located in Jakarta, Indonesia.

## **About BIMP-EAGA**

BIMP-EAGA, or Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area, is a subregional economic cooperation initiative established in 1994 to accelerate socio-economic progress in less-developed and geographically remote areas within Brunei Darussalam, Indonesia, Malaysia, and the Philippines. This initiative aims to narrow developmental gaps within the region by focusing on specific areas: the entire sultanate of Brunei Darussalam; the Indonesian provinces of Kalimantan, Sulawesi, Maluku, and Papua; the Malaysian states of Sabah and Sarawak and the federal territory of Labuan; and Mindanao and the province of Palawan in the Philippines. BIMP-EAGA is strategically designed to boost trade, tourism, and investments through various means, including facilitating the movement of people, goods, and services across borders, optimising the use of shared infrastructure and natural resources, and leveraging the economic strengths of each member area.

## About the BIMP-Korea Cooperation Fund

The BIMP-Korea Cooperation Fund (BKCF) was established in 2021, by the Republic of Korea as a cooperation framework with the BIMP-EAGA. The primary purpose of the BKCF is to promote inclusive and balanced economic growth within the BIMP-EAGA subregion. This initiative is designed to support projects that not only foster economic development, but also ensure that the benefits are distributed broadly across different areas and among various stakeholders. Furthermore, BKCF aims to contribute to the broader ASEAN Connectivity agenda, focusing on enhancing infrastructure, institutional frameworks, and interpersonal connections within the ASEAN Nations. By providing essential financial and technical assistance, the fund plays a crucial role in strengthening the BIMP-EAGA framework and enhancing its capacity to achieve its overarching development objectives.

# Acknowledgment

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### Indonesia:

- a. Ir. Wanhar, Director of Electricity Programme Development, Ministry of Energy and Mineral Resources (MEMR), Chair of PEIC
- b. Mr. Ridwan Budi Santoso, Division Head of Electricity Cooperation, MEMR
- c. Ms. Nur Hasfiana Hamuddin, Officer of Electricity Cooperation, MEMR

### • Brunei Darussalam:

- a. Pn. Shirley Sikun, Head of Energy Transition Division, Department of Energy (DOE)
- b. Pn. Nurul Hadinah binti Yahaya, Officer of Energy Transition Division, DOE

### • Malaysia:

- a. Dr. Nurleyna binti Yunus, Head of Energy Division, Ministry of Energy and Environmental Sustainability (MEESty)
- b. Pn. Jasmine Ann Gavin, Officer of Energy Division, MEESty
- c. Mr. Terence Leong Shuh Onn, Senior Manager of Business Development, Sarawak Energy
- d. Mr. Siaw Yang Loong, Business Development, Sarawak Energy
- e. Ir. Magdalene Chu Wai Quan, Deputy Chief Executive Officer, Energy Commission of Sabah (ECoS)
- f. Ir. Ts. Glenn Isaiah Stanley, Assistant Director Strategic Planning, ECoS
- g. Ms. Esther Lew, Principal Assistant Secretary of Renewable Energy, Ministry of Energy Transition and Water Transformation (PETRA)
- h. Mr. Mohd Razif Abd Halim, Managing Director, TNBX
- i. Mr. Yong Boon Heng, Head (Sustainability Solutions), TNBX

### • Philippines:

- a. Ms. Liza V Pangilinan, OIC Chief, NREB, DOE
- b. Mr. Edward V. Neri, Supervising Science Research Specialist, Renewable Energy Management Bureau, DOE
- c. Mr. Kevin John Y. Dela Cuesta, Market Development Manager, Philippine Electricity Market Corporation
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We extend our heartfelt appreciation to everyone who has contributed to the development of this publication. Your expertise, guidance, and support have been invaluable in making this endeavour a success.

## **Foreword from ACE**



**Dato Ir. Ts. Abdul Razib Dawood** Executive Director of ASEAN Centre for Energy (ACE)

I am pleased to present this comprehensive report on the development of a regional Renewable Energy Certificate (REC) framework for the BIMP-EAGA countries and the broader ASEAN region. This initiative is a significant step towards achieving the goals outlined in the ASEAN Plan of Action for Energy Cooperation (APAEC) and the development of the ASEAN Power Grid (APG).

As the region moves towards greater energy connectivity and integration, the establishment of a robust REC framework is essential for promoting renewable energy adoption and cross-border electricity trade. RECs provide a reliable and transparent mechanism for tracking and accounting for renewable electricity generation and consumption, enabling consumers to make credible claims about their renewable energy use.

This report highlights the growing significance of RECs in the global transition to clean energy and their role in achieving regional and national energy goals. It provides a detailed analysis of REC markets and stakeholders within the BIMP-EAGA region, examining market dynamics, regulatory contexts, and opportunities for market development. The report also explores the alignment of REC instruments with market and policy frameworks, emphasising the importance of integrating RECs for both domestic and international alignment.

The findings of this report underscore the potential of a regional REC framework to accelerate the transition to clean energy in BIMP-EAGA and the broader ASEAN region. By establishing a common set of rules and standards for REC issuance, tracking, and trade, the region can create a more efficient and integrated market for renewable electricity. This will not only attract foreign direct investment, but also support the development of cross-border electricity infrastructure, such as the APG.

The recommendations put forward in this report provide a clear roadmap for the development and implementation of a regional REC framework. The establishment of an ASEAN REC Taskforce, the adoption of a hybrid approach to market design, and the focus on capacity building are key steps towards creating a successful and sustainable REC market in the region.

The development of this report through RECAP has brought BIMP-EAGA and the ASEAN Centre for Energy closer together and created greater synergy, amplifying the impact of renewable energy adoption and cross-border electricity trade. By aligning the BIMP REC initiative with the APAEC and APG frameworks, ASEAN can create a more cohesive and integrated approach to energy transition.

ACE is committed to supporting the BIMP-EAGA countries and the broader ASEAN region in their efforts to promote renewable energy and achieve their energy transition goals. This report is a valuable resource for policymakers, market participants, and other stakeholders seeking to advance the development of a regional REC framework. We believe that this initiative will contribute significantly to the region's clean energy future and support the creation of a more sustainable and prosperous ASEAN.

Dato Ir. Ts. Abdul Razib Dawood

Executive Director of ASEAN Centre for Energy (ACE)

## **Foreword from BIMP-EAGA PEIC Chair**



### Ir. Wanhar

Director of Electricity Program Development, Directorate General of Electricity of the Ministry of Energy and Mineral Resources of Indonesia

It is with great honour that I present the Technical Notes on the Conceptual Regional Renewable Energy Certificate (REC) Framework for BIMP-EAGA Countries. This document represents a significant milestone in our continued efforts to foster a sustainable and integrated energy landscape across Brunei Darussalam, Indonesia, Malaysia, and the Philippines under the BIMP-EAGA Vision 2025.

As the BIMP-EAGA economies progress in their respective energy transitions, the role of market-based instruments such as REC becomes increasingly vital. REC serves as an enabling tool to stimulate additional renewable energy deployment, complementing national strategies and accelerating progress toward each country's clean energy targets.

In alignment with the aspirations of the BIMP-EAGA power interconnection under the ASEAN Power Grid (APG) initiatives, REC can facilitate the development of cross-border renewable energy trade, enabling participating countries to benefit from their respective resource complementarities while upholding environmental integrity and accountability.

The Technical Notes not only outlines the conceptual underpinnings of a REC framework tailored to the BIMP-EAGA context, but also sets the stage for greater harmonisation, cooperation, and policy alignment across our borders. It reflects our shared commitment to a low-carbon future and our collective determination to leverage regional collaboration in pursuit of energy security, economic development, and environmental sustainability.

This publication is the product of close collaboration among BIMP-EAGA stakeholders, with valuable contributions and insights drawn from broader ASEAN and global best practices. It reflects a shared vision

for a credible and interoperable REC ecosystem that is responsive to national priorities yet coordinated at the subregional and regional levels.

As one of the highlighted findings from the development of conceptual BIMP-EAGA REC framework (RECAP) project, the establishment of a regional REC Taskforce will be vital in advancing this vision. Such a platform would provide the necessary structure to guide policy alignment, technical harmonisation, capacity building, and stakeholder engagement across BIMP-EAGA and ASEAN. Through sustained collaboration, we can ensure that future REC-related initiatives are regionally coherent, technically robust, and aligned with our collective ambitions for a low-carbon and interconnected energy future.

On behalf of the Power and Energy Infrastructure Cluster, I extend my appreciation to all stakeholders who have contributed to the development of this document. It is my hope that this work will inform ongoing dialogues and guide the practical realisation of a regional renewable energy certificate ecosystem within BIMP-EAGA and the wider ASEAN region.

Ir. Wanhar

Director of Electricity Program Development, Directorate General of Electricity of the Ministry of Energy and Mineral Resources of Indonesia





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## **Abbreviations**

ACE	ASEAN Centre for Energy
AENBD	Autoriti Elektrik Negara Brunei Darussalam
AMS	ASEAN Member States
APG	ASEAN Power Grid
APAEC	ASEAN Plan of Action for Energy Cooperation
ΑΡΙ	Application Programming Interface
AIB	Association of Issuing Bodies
BAU	Business-As-Usual
вссо	Brunei Climate Change Office
BKCF	BIMP-EAGA–Republic of Korea Cooperation Fund
BIMP	Brunei Darussalam-Indonesia-Malaysia-Philippines
BNCCP	Brunei National Climate Change Policy
BPC	Berakas Power Company
BSP	Brunei Shell Petroleum
СВАМ	Carbon Border Adjustment Mechanism
CDP	(formerly Carbon Disclosure Project)
CDM	Clean Development Mechanism
CEN	European Committee for Standardisation
CGPP	Corporate Green Power Programme
CRS	Centre for Resource Solutions
DES	Department of Electricity Services
DGE	Directorate General of Electricity
DGNREEC	Directorate General of New Renewable Energy and Energy Conservation
DOE	Department of Energy
DU	Distribution Utility
EAC	Energy Attribute Certificate
EC	Electric Cooperative
ECOS	Energy Commission of Sabah
EECS	European Energy Certificate System
EGAT	Electricity Generating Authority of Thailand

EMA	Energy Market Authority
EPIRA	Electric Power Industry Reform Act
ERC	Energy Regulatory Commission
ERIA	Economic Research Institute for ASEAN and East Asia
ESG	Environmental, Social, and Governance
ETS	Emissions Trading System
FDI	Foreign Direct Investment
FiT	Feed-in Tariff
GET	Green Electricity Tariff
GHGP	Greenhouse Gas Protocol
GHGP2	Greenhouse Gas Protocol Scope 2 Guidance
GO	Guarantee of Origin
HAPUA	Heads of ASEAN Power Utilities/Authorities
ІСРТ	Imbalanced Cost Pass-Through
IEA	International Energy Agency
IEMOP	Independent Electricity Market Operator of the Philippines
IFRS S1	International Financial Reporting Standards 1
IFRS S2	International Financial Reporting Standards 2
IPP	Independent Power Producer
ISSB	International Sustainability Standards Board
I-REC(E)	International Renewable Energy Certificate for Electricity
I-TRACK	The International Tracking Standard Foundation
КҮС	Know Your Customer
LNG	Liquefied Natural Gas
LSS	Large-Scale Solar
LTMS	Lao-Thailand-Malaysia-Singapore
MEMR	Ministry of Energy and Mineral Resources
MEESty	Ministry of Energy and Environmental Sustainability of Sarawak
MRV	Measurement, Reporting, and Verification
MoU	Memorandum of Understanding
MyRER	Malaysia Renewable Energy Roadmap
N/A	Not Applicable
NCCS	National Climate Change Secretariat

NDC	Nationally Determined Contribution		
NEA	National Environment Agency		
NEM	Net Energy Metering		
NEPOOL GIS	New England Power Pool Generation Information System		
NETR	National Energy Transition Roadmap		
NEP	National Energy Policy		
NREL	National Renewable Energy Laboratory		
NY GATS	New York Generation Attribute Tracking System		
PEIC	Power and Energy Infrastructure Cluster		
PETRA	Ministry of Energy and Water Transformation		
РРА	Power Purchase Agreement		
PREM	Philippines Renewable Energy Market		
PREMS	PREM System		
QRE	Qualified Reporting Entity		
RE	Renewable Energy		
REC	Renewable Energy Certificate		
RECAP	Development of Conceptual Framework of Renewable Energy Certificate System Project		
RED II	Renewable Energy Directive		
REM	Renewable Energy Market		
REM B	Renewable Energy Management Bureau		
RE-SSN	Renewable Energy Sub-Sector Network		
RPS	Renewable Portfolio Standard		
RPO	Renewable Portfolio Obligation		
RUKN	National Electricity Masterplan		
RUPTL	10-year Power Development Plan		
SBTi	Science-Based Targets Initiative		
SESB	Sabah Electricity Sdn Bhd		
SOME	Special Senior Officials Meeting on Energy		
SPERA Hydrogen Hydrogen production and export project in Brunei			
SS 673	Singapore Standard for RECs		
ST	Suruhanjaya Tenaga (Energy Commission)		
ТИВ	Tenaga Nasional Berhad		

TNBX	TNB's innovation arm		
ToR	Terms of Reference		
TPES	Total Primary Energy Supply		
UGT	Utility Green Tariff		
UNFCCC	United Nations Framework Convention on Climate Change		
VRRE	Voluntary Reporting for Renewable Energy		
WRI	World Resource Institute		
ωтο	World Trade Organization		
WWF	World Wildlife Fund for Nature		

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## **Executive Summary**

The rising importance of RECs in the global shift towards clean energy is evident. This report delves into the Development of a Conceptual Regional REC framework for the Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA) countries, which reflect the insights of multiple stakeholder dialogues and meetings carried within RECAP activities over the past two years.

RECs are introduced with their historical context and their crucial role in substantiating renewable electricity consumption claims. RECs and carbon credits are distinct instruments, with different functions and applications. Voluntary REC markets are primarily driven by corporate sustainability commitments and reporting frameworks.

The mechanics of REC systems are explained, providing a deeper understanding of their role in tracking and accounting for renewable electricity generation and consumption. RECs are not MRV systems, but rather tracking instruments used to substantiate electricity use claims and support entity-level Scope 2 carbon accounting. The importance of aligning REC tracking instruments with MRV requirements is discussed to ensure credible renewable energy claims. This report outlines the core components of a robust REC tracking system, including standards, registries, and stakeholder mapping.

The focus then shifts to the BIMP-EAGA region, providing a country-specific analysis of REC markets and stakeholders, examining market dynamics and regulatory contexts. The REC market potential and regulatory landscape in each country are assessed, highlighting opportunities and challenges for market development. The interplay between compliance and voluntary REC markets is discussed, particularly in the Philippines, which has an RPS.

- **a. Brunei Darussalam:** The REC market is in its early stages, with limited asset registrations and liquidity. The market is driven by voluntary demand, primarily from multinational companies and the oil and gas industry. There are currently no stand-alone REC policies, but the government has ambitious national objectives in line with global sustainability goals.
- **b. Indonesia:** The REC market has shown rapid growth, with a diverse range of active vendors, brokers, traders, and buyers, including the national utility, PLN. Both I-RECs and TIGRs are transacted in the market, and PLN has developed a green tariff product. The country has significant potential in renewables, particularly hydro and geothermal.
- **c. Malaysia:** The country has one of the most effectively designed REC ecosystems in the region, with high issuance and consumption volumes, and a variety of procurement options. The market also features a higher level of government oversight than regional neighbours. Malaysia has an ambitious renewable energy targets set by 2050 and is a significant player in the ASEAN region's renewable energy landscape.
- d. The Philippines: The country is the only one in BIMP-EAGA with a compliance-based REC market,

driven by its RPS. The market has significant potential, but its execution has faced challenges related to inefficiencies between voluntary and compliance markets, and restrictions on access to globally credible procurement instruments.

The alignment of REC instruments with market and policy frameworks is explored, emphasising the importance of integrating RECs for both domestic and international alignment.

The need to align carbon markets, RECs, and Nationally Determined Contributions (NDCs) is discussed to avoid double counting and ensure efficient market operations. Drawing lessons from the European Union's experience, this report examines the role of RECs in facilitating cross-border electricity trade.

The regional REC framework is outlined with a focus on market governance, implementation options, and the benefits of a hybrid approach. The proposal for an ASEAN REC Taskforce aims to strengthen regional cooperation and improve market efficiency. Aligning national and regional REC systems is emphasised to prevent double counting and enhance collective bargaining power in external trade agreements.

The potential for a regional REC framework to accelerate the transition to clean energy in BIMP-EAGA and the broader ASEAN region is highlighted. To ensure the success of this framework, the following key actions are recommended:

- **a. Establish an ASEAN REC Taskforce:** This taskforce will serve as a governing body, providing a platform for dialogue and coordination among member states on REC market development and implementation.
- **b. Develop a regional REC framework:** This framework will outline international best practices and establish consistent rules for REC issuance, tracking, and trade across ASEAN, while also addressing unique national requirements.
- **c. Prioritise the hybrid approach:** This approach combines the reliability of established international systems, with the flexibility of national oversight, enabling countries to adapt their REC markets to national priorities while remaining aligned with regional and global standards.
- **d. Empower Local Issuers:** Local issuers will play a central role in connecting national REC systems to the regional markets and framework, ensuring alignment between domestic and regional REC market rules.
- e. Focus on capacity building: Targeted support, including training programmes, technical assistance, and knowledge-sharing initiatives, will ensure all member states can fully participate in the regional REC framework.





## 1.1. Historic Drivers of REC Demand

Electricity consumers place different values on power generated by renewable energy (RE) and non-RE sources. Driven by both economic and ethical considerations, many of the world's largest companies and their supply chains are willing to purchase renewables at a higher rate than conventional fossil fuel generation—creating opportunities for the corporate community to finance new clean power generation. There are two primary reasons for the price differentiation: (i) companies consuming renewable electricity can claim to be more sustainable than competitors, providing market advantages; and (ii) in economies that impose carbon taxes or other environmental regulations, companies can avoid these penalties by choosing to buy renewable power.

Over the past three decades, these drivers have led to a significant demand for clean electricity and a rapidly growing ecosystem to support reliable tracking and delivery to end users.

Globally, renewable energy certificates (RECs) have become the default delivery instrument for attributes associated with clean electricity production and consumption. They have been integrated into commercial contracts, policy documents, and regulatory systems across the EU and North America. They are gradually becoming integrated in a similar way across Asia, Africa, and Latin America.

**The need to track generation.** Once electrons enter the grid (as illustrated in Figure 11), it is impossible to distinguish their physical origin or the fuel type used to generate the electricity. This is because physical electricity, originating from multiple fuel types, is combined in the power pool, and subsequently delivered to a range of end users accessing shared transmission and distribution infrastructure.

As a result, for an end user to identify the "origin" of its electricity, it is necessary to separate the physical and non-physical characteristics of the power. The physical aspects of electricity are the electrons fed into the grid. The non-physical characteristics, commonly referred to as "attributes" are the facts that describe how the power was generated—such as the source of energy used to generate it, the location where it was generated, and the time at which it was generated.

Separating the physical and non-physical elements of electricity allows a given megawatt-hour (MWh) to be generated and sent into the grid and, in parallel, for its attributes to be separately stored and subsequently transferred from the generator to a specific end user.



Figure 1-1: Movement of Electrons and RECs

Source: I-TRACK Standard Foundation educational materials



### Chapter 1

**Book and claim systems.** A book and claim system tracks energy attributes by recording data from the generator, transferring it to the end user, and enabling the user to make a unique claim on consumption.

Originally developed in the EU and US, these systems allow end users to verify the type of electricity they consume and its environmental benefits. This enables them to demonstrate that their power consumption comes from renewable sources or is free from carbon emissions.

Beyond tracking energy generation and environmental attributes, book and claim systems play a crucial role in preventing double counting. They ensure that only one end user claims the environmental benefits associated with each megawatt-hour (MWh) of electricity.

**Standardisation of book and claim systems.** In some EU nations and US states, energy regulators introduced consumption requirements, mandating that utilities and large-scale electricity consumers source a specified percentage of their electricity from renewable sources. These regulations have relied on book and claim systems to verify compliance.

As consumption mandates evolved from voluntary corporate commitments to regulatory obligations, the need for standardised tracking systems became evident. This led to the development of the first Renewable Energy Certificate (REC) systems—structured, standardised, and widely accepted book and claim frameworks. These systems follow consistent tracking principles, including fair market treatment of all stakeholders, independence of issuers from market participants, and adherence to globally recognised best practices.

Where tracking systems cover both renewable and non-renewable power, the term REC is often broadened to Energy Attribute Certificate (EAC). Today, EAC and REC systems are used globally for regulatory compliance and to support voluntary corporate commitments to renewable energy consumption.

## **1.2. Fundamentals of REC**

## 1.2.1. Overview of REC Instrument

REC systems have become key components of virtually all corporate sustainability initiatives, and at the same time, have supported the implementation of hundreds of electricity and environmental policy initiatives around the world. In voluntary markets, the primary use case for RECs is for commercial entities to track and report on their clean electricity consumption to global reporting frameworks.

Conversely, under the regulated systems, RECs are used to track compliance or delivery under Renewable Portfolio Standard (RPS) and Renewable Portfolio Obligation (RPOs), all-attribute-tracking or full disclosure systems. Most recently, RECs help to enforce emission reductions under cross-border carbon taxation systems, like the Carbon Border Adjustment Mechanism (CBAM).

RECs act as digital proof confirming that a renewable source of energy has produced a MWh of electricity. They record facts, such as the production location, time, producer's identity, and type of energy used to generate electricity. This enables end users to track and claim ownership of the environmental attributes associated with power generation, including its low or zero carbon characteristics. Each REC is linked to a unique ID, which is stored in a digital database, or registry. This structure makes it possible for electrons to flow from their point of generation into a grid (comprising electricity from various sources), while retaining the traceability of non-physical attributes, from generator to end user.

RECs enable the transfer of environmental attributes from electricity producers to consumers. They fulfil two key roles: (i) businesses or households can use them on a voluntary basis to demonstrate that their electricity comes from renewable sources, not just the standard grid; and (ii) in areas with RE mandates, RECs serve as evidence of meeting policy or regulatory requirements. Systems in which corporates or households choose to buy RECs are considered voluntary markets.

At the same time, those in which policy requirements force their consumption are referred to as compliance markets—and the two can operate in parallel. The associated demand from both voluntary and compliance markets creates a market value for RECs—enabling independent power producers (IPPs), utilities, brokers, and traders to sell RECs for additional revenue, when compared to selling only the physical electricity.

For REC consumers, certificates support credible claims about using RE, helping them to assert reduced carbon emissions from their electricity use, and to report reductions to disclosure frameworks.

## 1.2.2. Similarities and Differences from Carbon Credits

RECs and carbon credits are fundamentally different instruments. While both allow entities to monetise and/or claim the use of specific environmental attributes, the instruments measure different things, are issued against different criteria, and are ultimately used for different purposes.

Perhaps the most critical difference is what is being measured, and how. RECs are an *ex post* instrument, which means that they can only be issued *after the* power generation has in fact taken place. In contrast, carbon credits often operate on an *ex ante*, or before the fact basis, whereby carbon credits can be issued based on predicted future events. Thus, a REC issuer can issue a REC only after confirming the electricity production with a meter.

On the other hand, a carbon credit can be issued on a predictive model, by comparing an assumed baseline scenario against activities used to diverge from it. For instance, carbon credits can be issued to an entity for preventing anticipated events, such as deforestation, against a baseline scenario under which deforestation is anticipated.

Another key difference is how the instruments are used. While carbon credits are used as offsets for a specific behaviour, RECs are used as tracking instruments to evidence a specific behaviour. For example, a polluting entity may be unable to directly reduce emissions associated with a specific activity, such as air transport, and as a result the entity could purchase carbon credits to "offset" this behaviour. In sharp contrast, an entity using RECs may wish to directly change its behaviour, such as by switching from standard electricity consumption to using only electricity generated by physical renewable generation. RECs provide a simplifies means to demonstrate that it has changed its power consumption behaviour.

The use of RECs is not considered offsetting, as it represents traceable changes in behaviour. With respect to the use of RECs and carbon credits from a disclosure perspective, RECs are used to specifically address Scope 2 emissions associated with electricity consumption, while carbon credits are more often used to offset emissions associated with Scopes 1 and 3 emissions.

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REC and carbon credit systems can and frequently do operate in parallel. Despite differences between RECs and carbon credits, as summarised in Table 11, harmonising both systems remains critical in avoiding double counting.

This is the case because both carbon credits and RECs can be issued for renewable power generation, and both systems require that all environmental attributes associated with such generation be captured by only one instrument—this is to ensure that only one entity makes associated claims linked to the environmental benefits of the power generation.

Торіс	REC	Carbon Credit	
Unit of Measure	MWh	Tonnes of avoided CO <sub>2</sub> (e)	
How it is measured	Meter readings ( <i>ex post-based</i> )	Varied methodologies (often assumption-based, ex ante)	
Issuance Process	Meter or financial data verified	Calculations using methodologies	
What it is used for	Scope 2 (emissions from electricity consumption)	Scope 1 and 3 (everything else: direct emissions and downstream suppliers)	

#### Table 1-1: Comparing RECs and Carbon Credits

Source: Author

### 1.2.3. Voluntary Market Potential and Structure

Voluntary markets are ones in which buyers conduct procurement voluntarily—that is, they are not required to do so by policies or regulatory structures. The common end users in voluntary markets are corporations with sustainability commitments within their supply chains.

In the context of ASEAN, most RECs in the region serve voluntary demand, except the Philippines with its RPS. As a result, corporate buyers and their supply chains are the key demand drivers for REC market growth, helping to finance generation in order to make public claims sustainable.

The fact that REC market demand in the region is primarily from voluntary end users establishes a need to align REC market designs with buyer requirements—ensuring willingness to buy is essential for market growth and success.

**Understanding buyer requirements in the voluntary market.** In the early stages of REC market development, corporate entities primarily self-reported their electricity consumption on company-issued sustainability reports. The practice of company-led Environmental Social and Governance (ESG) reporting has continued through sustainability reports.

However, several external reporting and disclosure platforms have since developed through multilateral partnerships comprising both public and private sector entities, and the non-profit community. These initiatives seek to improve the international credibility of corporate ESG reporting, standardise reporting protocols, and allow for uniform third-party validation of corporate ESG reporting.

Among the first (and still most prominent) of these reporting platforms is CDP. It provides one of the most comprehensive ESG reporting and disclosure platforms, covering social and environmental topics,

ranging from water to electricity consumption, and many other "scorecards" that guide corporate claims and capture market data associated with claims.

Entities reporting to CDP comprised more than 23,300 companies, including listed companies worth twothirds of global market capitalisation, and hold exceptional purchasing power in the energy space [1]. CDP and similar platforms provide standardised formats for corporates to disclose information about their ESG performance—typically requiring or recommending that disclosing entities follow the best practice guidance of various sector-specific disclosure initiatives. Requirements to track electricity consumption with credible REC instruments on CDP scorecards establish a key baseline for corporate reporting on clean electricity.

**Leading practices for electricity and emissions reporting**. In 2015, the World Resource Institute (WRI), together with the World Business Council for Sustainable Development, published the most widely used guidance on corporate emission reporting—the Greenhouse Gas Protocol (GHGP) and the associated Scope 2 Guidance (GHGP2).

GHGP2 provides best practices for corporates to make credible claims and disclose information on their electricity consumption (and associated emissions), and recommends the use of RECs as a preferred contractual instrument for substantiating clean electricity use claims. The GHGP2 description of credible claims is a key factor that influences how CDP Scorecards structure and request data from reporting entities.

Since the publication of GHGP2, several complementary "high impact" initiatives have developed to support the most ambitious corporations in disclosing and publicising their ESG progress [2].

**Growth and development of electricity disclosure frameworks.** Several "layer two" reporting systems have since emerged, building on the best practices established in GHGP2. Each of them recommends or requires that disclosing entities report progress through CDP scorecards and, building on best practices established in GHGP2, track electricity consumption claims with RECs.

The most prominent layer two reporting systems—both in terms of international visibility and the market cap of constituent members—are the RE100, the Science-Based Targets Initiative (SBTi), and most recently the Race to Zero campaign. Each of these has different recommendations and levels of ambition required of participating corporations.

For instance, RE100 is a group of the world's largest companies, all with public targets to consume 100% renewable electricity across their global operations by specific (individually defined) dates. All RE100 members report their progress through CDP scorecards.

SBTi encourages companies to set carbon reduction goals in line with the 1.5-degree decarbonisation pathway recommended by climate scientists and endorsed by UNFCCC. SBTi also recommends disclosure through CDP and the use of RECs to substantiate consumption claims.

The Race to Zero campaign encourages reporting entities to reach zero carbon emissions across their operations—both SBTi and Race to Zero look to both corporate-level emissions and supply chain decarbonisation.

The comparison of key characteristics of three major reporting frameworks and groups—CDP, SBTi, and RE100—is displayed in Table 12.

#### Table 1-2: Similarities and Differences of CDP, SBTi, and RE100

	CDP	SBTi	RE100
Who are they?	CDP is a not-for-profit organisation that runs the <i>global disclosure system</i> for investors, companies, cities, states, and regions to manage their environmental impacts.	A partnership between CDP, United Nations Global Compact, WRI, and WWF, <i>encouraging private sector emissions</i> <i>reduction through science-based emission</i> <i>reduction targets</i> aligned with the Paris Agreement.	A global initiative, led by Climate Group and partnered with the CDP, for companies to commit to 100% RE usage.
Membership	23,200 companies report through CDP globally (as of March 2024). Also open for cities, states, and regions.	4,205 companies and financial institutions validated by SBTi (as of December 2023) [3]. Open to all company sizes. Does not currently assess targets for cities, local governments, public sector institutions, educational institutions, or non-profit organisations. Targets are set at the parent/group level.	441 members globally (as of December 2024). Only companies consuming at least 0.1 TWh of electricity annually. Members join at the group level.
Noteworthy Requirements	Companies should substantiate clean electricity procurement with RECs. Disclosing companies should source renewable electricity from within the boundary of the market in which they are consuming the electricity. CDP recommends RECs should be at most 18 months old when used.	Apart from their own load, companies also encourage suppliers to buy RECs. Open to all sectors (excluding those noted below) but has a special focus on high-emitting sectors. Entities must set targets and reduce GHG emissions in line with the Paris Agreement.	Entities must source RECs from the same "market boundary" and from assets commissioned within 15 years. REC vintage should be "close" to the reporting year of the electricity consumption to which it is applied.
Scope	A disclosure system that allows entities to report, measure, and manage their environmental impact in the context of climate change (including Scope 1, 2, and 3 emissions), deforestation, and water security.	Apart from their own load, companies also encourage suppliers to buy RECs. Open to all sectors (excluding those noted below) but has a special focus on high-emitting sectors. Entities must set targets and reduce GHG emissions in line with the Paris Agreement.	All RE100 members must publicly commit to 100% RE by 2050 at latest. Does not measure decarbonisation: only measures RE consumption (Scope 1 & 2). Focus is on large companies.
Who is excluded	CDP disclosures are permitted for all sectors.	Cannot accept commitments or validate targets from companies in the oil and gas or fossil fuel sectors [4].	Companies in the fossil fuels, airlines, munitions, gambling, and tobacco sectors will not be considered for RE100 membership.
Recognised Energy Sources	Low-carbon technology types (In line with the IEA definition, low-carbon technologies are technologies that produce low-to-zero GHG emissions while operating. In the power sector this includes fossil-fuel plants fitted with carbon capture and storage (CCS), nuclear plants, and renewable-based generation technologies. Includes: Solar, wind, hydropower, nuclear, sustainable biomass, other biomass, renewable hydrogen fuel cell, marine, geothermal, fossil-fuel plants fitted with CCS, specified low-carbon energy mix, specified RE mix.	Should align with RE100 guidelines.	RE100 considers electricity from wind, solar, geothermal, sustainably sourced biomass (including biogas), and sustainable hydropower as renewable. Electricity from energy storage systems is not recognised. Hydrogen (a manufactured carrier–not an energy resource) is only considered renewable if produced from renewable resources. Electricity generated from hydropower and biomass is only recognised if sustainably generated, and RE100 recommends the sustainability be proven through third-party certification.

Source: Author compilation from the following sources,

- a. <u>CDP Technical Note: Accounting of Scope 2 emissions</u>
- b. <u>SBTi Corporate Near-Term Criteria (Version 5.2 March 2024)</u>
- c. <u>RE100 Joining Criteria</u>
- d. RE100 Technical Criteria (Version 12 December 2022)
- e. <u>Climate Change 2023 Questionnaire (in reference to the CDP's definition of low-carbon technology types)</u>

## 1.3. Standard REC Lifecycle

This section provides a detailed exploration of the lifecycle of RECs, from their initial issuance to their final use and redemption. It outlines the key processes involved in REC generation, registration, transaction, and retirement, highlighting the roles of various actors, such as RE generators, registry operators, and end users. Additionally, it introduces the concepts of bundled and unbundled REC transactions, which will be further elaborated upon in subsequent sections.

**Accounts and issuance of RECs**. The REC lifecycle begins with the generation of physical electricity, which the renewable electricity generator either feeds into the grid or uses on-site.

The power generator, or an authorised agent, must open accounts in a REC registry, which typically offers two account types. In I-REC terms, a "Registrant Account" is for registering and requesting REC issuance, while a "Participant Account" is for handling REC transactions, including trading and selling the RECs. Entities that manage both registration and transactions require both accounts.

After account setup, the Registrant identifies the Local Issuer responsible for verifying generation data in their country or region, and submits project registration details for the generation device's inclusion in the REC registry. The Registrant then requests the Local Issuer to issue RECs for previously generated power, providing necessary meter readings or financial proof (e.g. utility invoices) as evidence that generation has taken place.

Upon verifying this evidence, the Local Issuer grants one REC per MWh of production, depositing them into the custodial Participant Account identified by the Registrant. In many cases, Participant and Registrant accounts are held by the same legal entity [5].

**Transactions and use of RECs**. Once a Participant's account receives RECs, they can transfer them to other Participant accounts or redeem them on behalf of an end user. Financial transactions related to REC sales occur outside the registry, typically between the IPP and the end user, or through intermediaries in more complex deals. In many cases, an entity sells RECs to a trader, who then resells them to a REC user, though this intermediary step is optional.

Regardless of whether the REC is sold directly from an IPP to an end user or through an intermediary, its actual use is recorded in a Participant Account. Within this account, the Participant creates a sub-account for the REC-consuming entity and redeems the REC on its behalf. This redemption process generates a unique statement with an ID or link, which is traceable to the registry for verification.

RECs may be transacted alongside physical electricity—such as in power purchase agreements (PPAs), known as bundled transactions—or separately, as unbundled transactions. The distinctions between these transaction types are discussed in detail in later sections. *Figure 1-2* illustrates the REC lifecycle alongside relevant oversight documents.







Figure 1-2: REC Lifecycle Mapped Against Power Sector and Oversight Documents

Source: Authors

## 1.3.1. REC Ecosystem Health and Evaluation Considerations

A REC ecosystem functions effectively when it establishes uniform rules and tracking systems that transfer environmental attributes from power producers to end users. Its success depends on the participation of all key stakeholders, including power producers, government entities, electricity buyers, and the reporting frameworks they adhere to. For the system to be scalable, it must be perceived as credible by all involved parties.

A successful REC ecosystem strikes a balance between transparency, privacy, and security. Market operators must provide clear guidance on participation, fees, and REC-related data, ensuring broad accessibility. This includes public access to installation details, issuance records, and consumption volumes, while also allowing end users to verify specific REC attributes.

At the same time, safeguarding private data is essential. Confidentiality must be strictly maintained, with robust security measures to prevent unauthorised access, particularly regarding end-user identities and consumption choices. Disclosure of personal or sensitive information should occur only when required by legal standards, operational regulations, or explicit mandates.

To achieve global credibility, a REC ecosystem must align with and gain recognition from major international disclosure frameworks. For widespread adoption and scalability, REC products should comply with these frameworks, ensuring end users can confidently report their renewable energy use.

End users expect REC tracking systems to follow best practices established by international organisations and to receive formal recognition from disclosure programmes. Without this validation, national systems risk being considered inadequate under global standards.

Sustained scalability and long-term viability also require a diverse market with multiple participants, including a broad range of sellers and varied procurement options. This diversity enables the market to accommodate different purchasing preferences, fostering growth and continued adoption.

To assess the efficacy and impact of REC ecosystems, it is essential to establish clear evaluation metrics. This section delves into the key metrics used to gauge the health and progress of REC ecosystems, encompassing aspects like market growth, diversity of participants, transaction models, and the clarity of contractual and market guidance rules. By examining these metrics, stakeholders can gain valuable insights into the overall development and effectiveness of REC markets.

### **Evaluation Metrics**

Evaluation metrics assess the health and progress of REC ecosystems. Metrics include volumes, diversity of market actors, transaction models, and clarity of contracts and market guidance rules.

### a. Volumes

Reflecting market growth, volumes track the number of installed devices, and REC issuance and redemption figures. They indicate market activity and supply/demand dynamics. Rising device registration (number of assets) and issuance volumes (number of certificates issued) point to a growing supply and market interest, while increasing redemption volumes suggest growth in demand for renewables and associated tracking instruments to evidence its consumption. Growth in each of these categories should be monitored and used to evaluate the success of the market and its adoption by commercial actors.

### b. Diversity of Market Actors

A healthy REC market features a wide range of actors, promoting market resilience and competition. Buyers prefer to have options when procuring RECs, and having diverse REC products from a variety of vendors supports a market's health, driving innovation, fair pricing, and equitable financial distribution in the market—all factors that can promote the growth of REC markets and renewables in a country or region. Measuring the number of end users in a market can be complex [6], so the common practice is to focus on the number of account holders—specifically device owners (Registrants) and transactional accounts (Participants) within a country.

### c. Transaction Models

The number of procurement models available to end users reflects a REC market's maturity and indicates procurement opportunities in a country, associated with its wider energy sector. A broad spectrum of options, including bundled and unbundled RECs, marketplaces, and traders, indicates a well-established environment that can be scaled to meet end-user needs and help finance new generation capacity. The diversity of these transaction structures —and the legal frameworks that reinforce them—are key indicators of corporate clean energy procurement health.

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However, it is worth noting that REC registries do not track this information. For a comprehensive understanding of how transaction structures have evolved in a country over time, domestic actors should refer to national energy documents and REC market guidance. Since PPAs, green tariffs, and rooftop installation options are all energy sector policies that are evidenced by the delivery of RECs, the wider health of a REC ecosystem should review registry data alongside energy sector policy and procurement options.

### 1.3.2. Compliance Markets in the REC Ecosystem

Compliance markets facilitate the achievement of national or regional objectives. They are different from voluntary markets in that they are often directly integrated into national policies, energy sector regulations, or trade agreements. Under compliance systems, RECs are often mandated to be issued in accordance with law, and REC buyers primarily conduct procurement to avoid penalties or taxes, rather than for disclosure purposes alone [7]. Under compliance systems, RECs act as an accounting tool to track compliance in a transparent and standardised manner. In countries like the Philippines, which have compliance systems, the consumption potential is often directly set by a policy document or regulator. When evaluating potential demand in countries with both voluntary and compliance markets, the compliance target serves as a baseline and voluntary demand should be added on top.

National compliance markets are often used to meet wider country objectives under established energy policies or international agreements, rather than REC-specific policies. Objectives may include: (i) increasing the share of RE in the grid (commonly implemented through RPS policies); (ii) reducing GHG emissions in target industries (often implemented as emission caps or emission trading schemes); or (iii) meeting commitments under international agreements such as the Paris Accord [8] Compliance markets can directly incorporate REC considerations (as is the case with the RPS in the Philippines) or indirectly allow for the consumption of RECs to support decarbonisation under non-energy policies like emission trading schemes. The emergence of CBAM promises to introduce a new generation of compliance markets, which will have far-reaching impacts on ASEAN, including its sub-regions cooperation, such as BIMP-EAGA, Greater Mekong Subregion, etc, due to their positioning as supply chain hubs and exporters relevant to the EU economies where CBAM is being implemented.

### What We Do and Don't Know about the Carbon Border Adjustment Mechanism

**Objective of CBAM**. The EU has introduced the CBAM in order to price emissions in carbonintensive goods/commodities entering the EU. The mechanism forms a part of the EU's larger strategy to promote cleaner industrial production worldwide, especially in non-EU countries.

It does so by applying pricing mechanisms to emissions associated with goods imported into the EU, including embedded emissions (such as those associated with electricity consumption used in production).

**Design**. CBAM supports EU industry decarbonisation and connects with the EU emissions trading system (ETS), as it gradually phases our free allowances [9]. CBAM ensures that

imported goods reflect a carbon price equivalent to that of domestic production, aligning with the EU's climate goals. Its design aims for compatibility with World Trade Organization (WTO) rules, and to facilitate alignment of carbon prices between EU producers and those exporting into the EU [10].

**Implementation timeline**. The EU approved CBAM in May 2023, under regulation 2023/965 *"Establishing a carbon border adjustment mechanism"* [11]. With a transitional period from 1 October 2023 to 31 December 2025 [12], and further implementing acts due by 30 June 2025.

CBAM will phase in pricing mechanisms by commodity class, starting with cement and fertiliser, expanding to cover metals and other products with higher Scope 2 emission values.

**Mandate for emission reporting**. CBAM requires reporting on product emissions for various imported commodities listed in Annex I, including iron, steel, cement, aluminium, fertilisers, electricity, and hydrogen.

**Options for commodity producers**. Commodity producers (declarants) complying with CBAM have two choices. They can use default emissions factors for indirect emissions, or apply actual embedded emissions. The latter relies on proving a direct physical link or a PPA with a renewable electricity producer for the equivalent amount of electricity used in production. PPAs, combined with EACs, are crucial for CBAM's global implementation, as they provide the necessary renewable claims for contractually defined emission ownership (a requirement under CBAM).

**Areas to be further defined**. Key aspects of CBAM, such as specific requirements for valid PPAs, are still undefined. The Commission's broad interpretation of PPA may cover various contractually defined emissions ownership agreements between energy producers and users, but it remains to be seen whether the definition of PPAs under CBAM will allow for the widest array of options (starting with PPAs and moving all the way to unbundled transactions). They may establish a narrower definition, which could restrict the use of unbundled RECs.

Regardless of the definition of PPAs, it is likely that any definition would require the use of REC redemptions. The uncertainty stems primarily from whether unbundled REC transactions will be permitted, alongside the high likelihood of accepting physical PPAs with associated RECs.

These uncertainties in CBAM highlight the need for further clarification and guidance as the implementation date nears. Figure 1-3 indicates a wide range of REC-denominated structures that may in the future be accepted under CBAM, but which will need to be clearly defined in the policy document and associated guidance materials.



Source: Authors, based on I-TRACK Standard presentation materials.

The movement of RECs across-borders can drive demand and increase prices, while also supporting or stalling the development of regional grid infrastructure, such as the ASEAN Power Grid (APG). Particularly where REC shortages exist, as is the case in Singapore, imports from neighbouring countries can help meet domestic consumption goals. At the same time, exports from regional neighbours can help finance new projects in countries where RE resources (and land area) are more abundant. Establishing a REC framework can facilitate and scale up regional transactions of RECs across-borders—namely by helping ensure specified transactions meet the requirements of reporting frameworks.

The ability to use RECs across-borders is contingent on two primary factors. The first is the ability of a REC registry to provide settlement functions between two countries. The voluntary markets active in BIMP and ASEAN currently provide this functionality. The second factor to consider is whether or not reporting frameworks will recognize the transactions. Currently, reporting frameworks only recognise cross-border REC transactions in the EU—effectively blocking or discouraging end users with RE100 commitments from conducting cross-border REC transactions in the region. While cross-border markets are not considered compliance systems, government-to-government agreements can facilitate framework acceptance of RECs. In the EU, there are precedents for how policy documents, together with non-regulatory guidance materials (frameworks) can facilitate such transactions and impact supply and demand across both voluntary and compliance markets.

In the Philippines compliance system, the RPS Rules and associated policy documents establish the mandated entities and portions of renewables they are required to use. This establishes the baseline for

compliance market potential in the country. However, the introduction of compliance demand under CBAM is likely to introduce a new category of buyers. Since the existing domestic system is not currently capable of servicing voluntary demand (or any non-mandated buyers) it is possible that domestic registry, standards, and operating laws will need to be adjusted considerably to create opportunities for domestic industry to meet international trade compliance rules in the future.

It is also possible that CBAM will identify acceptable registries and standards for compliance, likely considering first the systems used regionally as opposed to national registries. Building on standard practices established in voluntary markets, it is likely that CBAM-approved systems will be those currently used in the market—I-REC and TIGRs—as they are already part of an established REC ecosystem that has been fully integrated into corporate GHG accounting. Apart from the Philippines, other ASEAN nations have unrestricted access to the voluntary I-REC and TIGRs systems, which are in principle designed to serve as compliance tools under CBAM.

The potential size of the compliance market under CBAM is likely to be enormous (given the scope of export goods it covers), but is still not possible to calculate accurately. This is the case because the actual emission values, levies, and taxes associated with indirect emissions are not yet published—meaning that even individual exporters cannot yet calculate their compliance mandates, let alone in the aggregate. However, and despite the need for further clarification in CBAM rules, current documentation establishes a simple fact: **a new compliance system will soon impact exporters across BIMP and the wider ASEAN region.** RECs will be a key tool for meeting export mandates and reducing tax exposure in the region.

### 1.4. Clarity of Contracts and Market Rules

Transparent and explicitly defined contracts that clearly state attribute ownership, as well as the associated procedural guidelines for trading, are signs of a mature market. Such clarity in contracts and rules ensures smooth transactions, reduces misunderstandings, and upholds legal compliance. Additionally, the precision in these documents mirrors the market's ability to adapt to changing regulations and stakeholder needs.

### 1.4.1. Compliance Markets in the REC Ecosystem

Compliance markets are designed to support national and regional policy objectives. Unlike voluntary markets, they are often directly integrated into energy regulations, trade agreements, or broader government policies [13]. Under these systems, REC issuance is typically mandated by law, and buyers procure RECs primarily to meet legal obligations and avoid penalties or taxes, rather than solely for disclosure purposes.

RECs function as an accounting tool within compliance markets, providing a transparent and standardised mechanism for tracking renewable energy consumption. In countries with compliance markets, such as the Philippines, consumption targets are often set by policy documents or regulators. When assessing demand in markets with both compliance and voluntary components, the compliance target serves as the baseline, with voluntary demand layered on top.
National compliance markets generally align with broader energy policies or international commitments rather than REC-specific regulations. Their objectives often include:

- a. Increasing the share of renewable energy in the grid, commonly through Renewable Portfolio Standards (RPS) policies.
- b. Reducing greenhouse gas (GHG) emissions in key industries, often via emission caps or trading schemes.
- c. Fulfilling commitments under international agreements such as the Paris Accord.

Compliance markets may directly integrate RECs, as seen in the Philippines' RPS, or indirectly recognise them within non-energy policies like emissions trading schemes. The introduction of the Carbon Border Adjustment Mechanism (CBAM) is set to reshape compliance markets, particularly in ASEAN. Given their role as supply chain hubs for the EU—where CBAM is being implemented—sub-regions such as BIMP-EAGA and the Greater Mekong Subregion will likely be significantly impacted.

The movement of RECs across borders influences demand and pricing while also affecting regional grid infrastructure development, such as the ASEAN Power Grid (APG). In markets with REC shortages, such as Singapore, imports from neighbouring countries help meet domestic consumption targets. Conversely, exporting RECs allows resource-rich nations to finance new renewable projects. Establishing a robust REC framework can facilitate and scale cross-border transactions by ensuring they align with reporting framework requirements.

Cross-border REC transactions depend on two key factors. First, REC registries must provide settlement functions between countries. Voluntary markets in ASEAN and BIMP-EAGA currently support this functionality. Second, reporting frameworks must recognise these transactions. At present, only the EU acknowledges cross-border REC transactions, restricting or discouraging end users—particularly those with RE100 commitments—from engaging in such transactions within ASEAN. While cross-border REC trading does not fall under compliance systems, government-to-government agreements can support REC acceptance. Precedents in the EU demonstrate how policy documents and non-regulatory frameworks can enable such transactions, influencing supply and demand across both compliance and voluntary markets.

In the Philippines, the RPS Rules and associated policies define the entities required to use renewable energy and the minimum share they must procure. This establishes the baseline for compliance market potential. However, CBAM is expected to introduce a new category of buyers. Given that the Philippines' domestic REC system currently serves only mandated buyers and lacks capacity for voluntary transactions, adjustments to registry operations, standards, and regulations may be necessary to enable domestic industries to comply with international trade requirements.

CBAM may also specify acceptable registries and compliance standards, likely favouring regionally established systems over national frameworks. Given that voluntary markets have already set standard practices, CBAM-approved systems will likely include existing market leaders such as I-REC and TIGRs,

which are already embedded in corporate GHG accounting. While the Philippines faces restrictions, other ASEAN nations have unrestricted access to these voluntary systems, which are inherently designed to serve as compliance tools under CBAM.

The potential scale of the compliance market under CBAM is vast, given the wide range of export goods it affects. However, precise calculations remain challenging because emission values, levies, and taxes on indirect emissions have yet to be published. Even individual exporters cannot currently determine their compliance obligations. Despite this uncertainty, existing CBAM documentation makes one fact clear: a new compliance system will soon impact exporters across ASEAN and BIMP-EAGA. RECs will be essential for meeting export requirements and minimising tax exposure in the region.

## **1.5. Background and Development of ASEAN RECs**

The core objective of the development of a conceptual framework for a Renewable Energy Certificate System (RECAP) Project is to establish a strong foundation for a regional REC market within ASEAN, starting with a focus on Brunei Darussalam-Indonesia-Malaysia-Philippines (BIMP) nations. This will involve thoroughly understanding the region's drivers and demand, alongside each nation's REC readiness and current regulations. This technical note is aimed at charting pathways to harmonise and provide best practices guidance for REC markets across ASEAN.

As of January 2025, all 10 ASEAN Member States (AMS) provide access to REC tracking systems, with transaction volumes varying by country. All nine countries with tracking systems use the I-REC standard and associated Evident Registry for voluntary issuance and transactions, while six of the countries also have an active TIGR Registry. Table 13 lists the different tracking systems and associated volumes for each of the AMS. All four BIMP countries use tracking systems, with government involvement also varying by country.

Positive trends include consistent volumetric growth and progress against key indicators including: (i) growth in the number of certificates issued and consumed year-on-year; (ii) increased number of market actors, including generators, buyers, and entities with registry accounts, (iii) recognition from governments on the need to track power sales with RECs, including for cross-border transactions; and (iv) increased availability of bundled structures, such as green tariffs and power purchase agreements (PPAs).

Continued growth in ASEAN REC markets can increase installed renewable capacity with a decreased need for public sector subsidies. The promulgation of REC markets will also play a key role in achieving international environmental targets and ensuring compliance with global trade agreements.

Table	1-3: AS	SEAN	Voluntary	/ Market	Issuance	and (	Consum	ption	Volun	res

Country	Instrument	Total Issued (2023 Vintage)	Total Redeemed (2023 Vintage)
Brunei Darussalam	I-REC	5,081	4,520
	TIGRs	0	0
	Combined	4,420	N/A
Cambodia	I-REC TIGRs Combined	114,010	27,239
Indonesia	I-REC	1,845,541	1,314,036
	TIGRs	2,354,434	N/A
	Combined	3,745,971	N/A
Lao PDR	I-REC TIGRs Combined	801,790	58,099
<b>Malaysia</b> *Includes peninsular Malaysia, Sabah, and Sarawak given that disaggregated data is not searchable in existing datasets.	I-REC TIGRs Combined	10,118,214 230,800 11,359,169	9,132,428 N/A N/A
<b>Myanmar</b> *The I-TRACK Foundation approved Myanmar for I-REC(E) by December 2024)	I-REC TIGRs Combined	N/A N/A N/A	7,336
<b>Philippines</b>	I-REC	4,458,356	2,684,845
*Include the voluntary RECs, given that	TIGRs	22,000	N/A
the compliance	Combined	3,011,349	N/A
Singapore	I-REC	282,180	1,463,509
	TIGRs	551,282	N/A
	Combined	579,419	N/A
Thailand	I-REC	9,400,653	3,762,204
	TIGRs	60,877	N/A
	Combined	7,899,938	N/A
Vietnam	I-REC	21,504,543	3,472,443
	TIGRs	904,113	N/A
	Combined	15,006,084	N/A

Source: Publicly available registry data provided by Evident (I-REC data) and APX (TIGR data). Note: To the knowledge of the authors, TIGR redemption data is not publicly available.

Table 1-4 provides a concise overview of the similarities between three key voluntary reporting frameworks applicable to REC markets in the BIMP region: CDP reporting, SBTi, and RE100. While each framework has its own specific requirements and focus areas, they share several common features that are relevant for understanding the dynamics of voluntary REC demand in BIMP. These similarities highlight the interconnected nature of these frameworks and the importance of a coordinated approach to REC market development in the region.

	CDP	SBTi	RE100
Context	Any entity that reports clean electricity use through a CDP scorecard and has a physical electricity load in any of the BIMP nations will be required to submit associated RECs redemptions under their CDP disclosures.	Supply chains operating in BIMP are potential REC hubs due to the commitment of companies to support supplier decarbonisation.	RE100 members with operations in BIMP must address electricity consumption through RECs, following the RE100 rules on REC procurement.
Similarities	All markets in BIMP serve voluntary demand. Only I-RECs and TIGRs are accepted REC instruments for voluntary reporting. Both SBTi and RE100 report on CDP Scorecards. All three take best practice from guidance provided by the Greenhouse Gas Protocol.		

Table 1-4: Relevance of BIMP REC Markets with CDP, SBTi, and RE100

While all ASEAN nations currently have active REC markets in place (most of which were established in 2017), the concept of a regional ASEAN REC market was first explored in the ASEAN Plan of Action for Energy Cooperation (APAEC) framework in 2019. The proposal was formally introduced to the Renewable Energy Sub-Sector Network (RE-SSN) during its 26th Annual Meeting in Danang, Vietnam. The RE-SSN—a working group focused on renewable energy initiatives—recognised that RECs can play a complementary role in scaling up APG, which has been facilitating cross-border grid connections and bilateral power trade since APAEC's inception in 1999.

Thailand's RE-SSN focal point presented the development plan for the regional REC framework at the Special Senior Officials Meeting on Energy (Special SOME) on January 21, 2020. Later that year, Singapore's National Environment Agency (NEA), through its RE-SSN focal point, the Energy Market Authority (EMA), also expressed interest in the initiative. However, due to resource constraints, discussions were halted until ACE submitted a proposal to the BIMP-EAGA–Republic of Korea Cooperation Fund (BKCF) in January 2022.

Although limited (initially) to the member countries of the BIMP, the REC initiative received full support from RE-SSN. The project gained momentum when ACE secured a BKCF grant in December 2022. The RECAP spanned two years, with the primary objective of establishing the foundation for a regional REC market in ASEAN.

# 1.6. Opportunities Associated with Having a Conceptual Regional REC Framework

In the ASEAN context, regionalising REC markets offers several key benefits:

- a. Enhancing guidance and improving the accuracy of information for all market participants;
- b. Strengthening market health while improving measurement, reporting, and verification (MRV) against key indicators;
- c. Facilitating cross-border REC transactions in alignment with demand-side reporting frameworks such as RE100 and SBTi; and
- d. Deepening regional cooperation and increasing national involvement in market oversight.

The BIMP cluster is actively working on grid interconnectivity and market alignment, providing an optimal environment for assessing and refining REC market structures. These efforts can serve as a foundation for broader regional expansion across ASEAN.

**Improve guidance and accuracy of information for all actors in the region.** REC markets are still emerging in BIMP and the broader ASEAN region, resulting in a lack of clear guidance for stakeholders on roles, timing, and procedures. This uncertainty creates confusion among market participants, from issuance processes to consumption claims.

A unified document outlining these processes can enhance market efficiency for all stakeholders. Regional REC frameworks typically serve as market guidance rather than regulatory documents, incorporating input from both government and the private sector. Best practices in framework design focus on improving guidance and market stability by clearly defining the roles of different market participants and specifying responsibilities in REC production and usage.

**Define indicators and set market health targets for MRV.** While market health indicators are generally consistent worldwide, each country and region should establish specific, measurable, and time-bound targets to track progress. These indicators, discussed in an earlier section, typically include the number of RECs issued and redeemed, the number of active market participants, the diversity of REC options (in terms of fuel type and vintage), and the availability of various transaction structures, such as PPAs, self-consumption, green tariffs, and bundled or unbundled procurement options.

To the authors' knowledge, MRV procedures for REC markets in the region remain in the early stages of development [14]. Setting clear targets at both national and regional levels would enable governments to shape REC market design around specific objectives and leverage REC transactions to finance, monitor, and guide progress

Establishing targets at both the national and regional levels would allow governments to focus REC market design on specific goals and, subsequently, to leverage REC transactions to help finance, track, and guide progress.

A uniform framework for setting targets would also facilitate cross-country comparisons. While MRV procedures can be defined at either the national or regional level, aligning national targets within a

regional framework offers additional benefits. It allows for benchmarking market health and progress between countries, encouraging knowledge sharing and scalability.

More broadly, transparent, and standardised MRV practices across the region would benefit all market participants. IPPs could more accurately assess the value of their resources across different jurisdictions, while utilities and regulators could better plan supply-side targets for bundled products. On the demand side, clear identification of transaction options would enable end users to procure RECs with greater confidence and collaborate with national stakeholders to address supply gaps and advocate for the legalisation of new procurement structures—supporting long-term market growth.

**Facilitate cross-border transactions in line with APG and the reporting frameworks.** For cross-border electricity transactions to gain international credibility, they must be recognised by global reporting and disclosure frameworks. The primary frameworks include RE100 and SBTi, with most energy buyers substantiating environmental claims through CDP Scorecards and aligning with the guidance in the GHGP2. However, RE100 currently recognises cross-border transactions only within the EU, creating a significant barrier to physical cross-border electricity projects in ASEAN. This lack of recognition undermines the financing of regional transmission projects by reducing buyer confidence in procuring clean electricity from neighbouring countries.

A regional REC framework can influence the willingness of reporting frameworks to acknowledge cross-border transactions, thereby shaping end-user interest in cross-border procurement. By formally articulating government positions on permitting or restricting transactions, such a framework can help align regional markets with international disclosure expectations. Additionally, it can demonstrate adherence to best practices for cross-border transactions, including:

- a. ensuring the physical transfer of electricity between markets;
- b. implementing uniform REC systems to prevent double counting; and
- c. standardising methodologies for calculating and disclosing grid mix and residual mix emission factors.

These elements should be clearly outlined in a regional framework and shared with key reporting and disclosure bodies, such as RE100 and SBTi, to establish alignment with global best practices. A well-structured regional REC framework can also facilitate physical cross-border electricity transactions by providing the necessary foundation for their acceptance by RE100 and other reporting frameworks.

In the BIMP subregion, this could strengthen demand-side interest in power imports, supporting cross-Borneo transmission infrastructure. More broadly, as national and market actors advance projects like the ASEAN Power Grid (APG) and the Lao-Thailand-Malaysia-Singapore (LTMS) initiatives, a regional REC framework can help secure greater international recognition for electricity transactions under these programmes..

**Support regional cooperation and government involvement in regulation.** A regional REC framework can encourage national actors to take a more active role in market guidance, while also establishing

uniform operating principles to support coordinated growth across ASEAN. By adopting a common set of rules, governments can better align domestic and regional market development efforts.

For example, regional coordination on REC market design can strengthen governments' collective bargaining position in international trade agreements, such as CBAM, while also enabling the use of RECs to meet national power sector objectives through compliance mechanisms. Additionally, a regional framework can help close knowledge gaps among buyers, drive more robust market development, and enhance buyer confidence.

Such a framework offers direct commercial benefits to utilities, independent power producers (IPPs), brokers, and end users by clarifying roles within the market and providing a structured outlook on future developments.

**Limitations of Conceptual Regional REC.** The regional REC framework discussed earlier refers to the expectation of a fully functional technical framework, building upon the conceptual REC framework developed under RECAP [15]. While the conceptual framework serves as a starting point by outlining fundamental elements, it has several limitations. It is non-regulatory, has a limited scope, and lacks specific targets and procedures for measurement, reporting, and verification (MRV), which may reduce its effectiveness in guiding and regulating the market.

Additionally, challenges remain in facilitating cross-border transactions and ensuring harmonisation across the AMS. These issues require further technical discussions and consensus-building, ideally aligned with ongoing APG discussions.

A fully developed technical regional REC framework—incorporating a broader ASEAN perspective, clear regulatory guidelines, defined MRV targets, and solutions for cross-border transactions—would significantly enhance market stability, facilitate regional cooperation, and drive REC market integration. Developing this framework should be a priority for ASEAN, building upon the BIMP's conceptual framework, while addressing its gaps to unlock the full potential of REC markets in supporting renewable energy adoption and cross-border electricity trade.







# 2.1. RECs Are Not a Typical MRV System

While RECs and MRV systems share some similarities, they serve different purposes. MRV systems generally function as reporting frameworks. They establish rules for what needs to be disclosed, how the disclosed information should be reported (such as through CDP scorecards), and the metrics that should be used to verify disclosures.

In contrast, while RECs facilitate disclosure within MRV systems, RECs do not independently set out rules for disclosure, monitoring, or verification, and are therefore not MRV systems themselves. Instead, RECs are tracking instruments used to substantiate electricity use claims and to support associated entity-level Scope 2 carbon accounting.

RECs allow entities to conduct disclosure within MRV frameworks, many of which require use of RECs to prove renewable electricity use when making clean energy claims. In the RECs and electricity context, MRV systems provide a structured approach for reporting and verifying consumption and emissions data in a local or international context, or both.

MRV systems can generally be categorised into two types; National MRV systems, and International MRV systems. Both provide frameworks for monitoring, reporting, and verifying, and may require the use of RECs to validate renewable electricity use claims.

However, key differences between these systems include their scope of coverage and compliance mandates, as detailed in Figure 2-1.



Figure 2-1: Intersection between RECs (RE Tracking) and MRV (Reporting)

**National Level**. National MRV systems that utilise RECs for tracking purposes include Renewable Purchase Obligations (RPO) in India and Renewable Portfolio Standards (RPS) in the Philippines. These schemes establish rules for utilities and other obligated entities, typically requiring them to track and report their renewable energy production or consumption. Compliance and claim validation are enforced through REC redemptions. The regulatory framework governing RPS and RPO MRV systems is typically embedded within national energy policies or regulations, with government-mandated participation.

These systems are generally limited to the implementing nation's geographic boundaries, meaning compliance is required only for domestic entities, while external entities remain unaffected. The Philippines' domestic RPS, for example, mandates the use of locally issued RECs for disclosure, demonstrating how a national MRV system integrates RECs into regulatory compliance. Because the RPS rules in the Philippines explicitly require obligated entities to use RECs for disclosure, alignment between the domestic REC system and national MRV requirements has already been established.

While further efforts to align national and international MRV systems operating in the Philippines may be beneficial, they are not necessary for domestic compliance. To explore the concept of aligning national and international MRV frameworks, the following section examines international MRV systems.

**International Level**. Often implemented in parallel to National MRV systems, international MRV systems consist of reporting frameworks adopted by global actors to ensure consistent carbon accounting and clean electricity use claims. These systems include various standards and protocols that provide broad guidelines and global best practices.

Among the most recognised set of guidelines is the GHGP, which offers global standards for carbon accounting, clean energy procurement, and reporting—including specific guidance on Scope 2 and the use of market-based instruments, such as RECs, for use in disclosure.

Voluntary international MRV frameworks like GHGP, RE100, and SBTi, are the most adopted systems for corporate electricity buyers. In addition, the market is currently witnessing the emergence of a new paradigm of regional and international compliance MRV systems that may use RECs and similar market-based instruments to substantiate compliance-level clean electricity claims.

Notable examples include the EU's CBAM, and the International Sustainability Standards Board's (ISSB) International Financial Reporting Standards 1 and 2 (IFRS S1 and IFRS S2) [16]. These systems respectively focus on addressing emissions associated with the trade of physical goods as well as corporate disclosure of environmental performance.

Both CBAM and ISSB are in the process of developing their own MRV requirements, which will bind disclosing entities to report environmental performance using specific instruments, such as RECs. The MRV rules for GHGP, RE100, and SBTi are published and fairly robust, though they undergo periodic updates.

While the MRV rules for CBAM and ISSB are still being developed, it is likely that both systems will require the use of RECs or other contractual instruments when making electricity consumption disclosures. However,

it is important to note that, while these systems may suggest or require the use of RECs to denominate certain transactions (such as PPA) this does not mean that all REC instruments and procurement types will be accepted.

For instance, RECs may be required to demonstrate participation in a PPA; while at the same time, CBAM and IFRS may elect not to accept the use of unbundled RECs. These decisions are forthcoming, and the preceding information is based on the authors' interpretation of market dynamics and not published MRV guidance by these systems.

# 2.2. Ensuring REC Tracking Instruments Meet MRV Requirements

It is essential that the REC system used for tracking attribute ownership and credible claims aligns with the rules and best practices established in the MRV framework, to ensure that RECs are used effectively within the context of an MRV system. For instance, if a national MRV system (such as the Philippines' RPS) directly requires the use of a specific REC tracking system (such as the Philippines Renewable Energy Market [PREM]), then it is necessary that obligated entities reporting to the national MRV system use the specified PREM REC.

Similarly, where international MRV systems like RE100 directly reference the use of international tracking instruments like the I-REC for electricity (I-REC(E)), entities making disclosure to RE100 should make use of the disclosure instruments specified by the framework. In the case of both domestic and international MRV systems, it is common for the guidance documents that govern MRV disclosure to mention acceptable instruments or minimum quality requirements.

Therefore, as a minimum alignment criterion between REC and MRV systems, the REC instrument being used by electricity buyers should conform to the requirements of the given MRV system to which disclosing entities are reporting.

The REC system should provide functional tracking that meets the needs of both the MRV system and the platforms where disclosures are made. For instance, obligated entities under the Philippines RPS are instructed to use PREM RECs for disclosure, and should therefore use these specific instruments when making disclosure to that particular MRV system.

Likewise, where disclosing entities under international voluntary reporting frameworks are advised to use I-REC(E) for disclosure, it is equally important for them to make disclosures using the specified instrument.

When considering alignment between national and international systems, domestic ones generally take precedence. This is the case because a disclosing entity in a national context is most often making specific disclosures in line with *a law that binds them to action*. In contrast, disclosure to an international reporting framework is not compulsory.

Nevertheless, alignment of national and international REC systems is critical for ensuring the sustained economic competitiveness of a country. For instance, if a domestic MRV framework makes it impossible for private sector actors to gain access to REC instruments that they view as important for participating in

global reporting, the entity may elect to shift operations to a country or region that makes both possible.

As the new paradigm for regional and global MRV becomes more integrated with the trade of physical goods (specifically under CBAM), it is likely that electricity buyers and corporations will place a growing degree of importance on access to instruments that enable them to fulfil associated international MRV requirements.

Beyond simply conforming to the specific requirements of individual MRV frameworks, several broader components are crucial for establishing a robust and effective REC tracking system that seamlessly integrates with various MRV systems. These components ensure that RECs can be reliably used to support credible RE claims across different reporting contexts, both domestically and internationally.

While the specific conditions in each country will vary, these components offer valuable guidance for policymakers and market participants seeking to optimise the design and implementation of their REC systems.

**Alignment with national electricity sector rules.** When adapting global tracking systems for domestic use, or when domestic actors develop independent systems, it is essential that the tracking system meet the needs of existing policy or regulatory requirements within the country. Government actors can take multiple approaches to accomplish this.

Access to globally recognised REC instruments. Commercial actors must be able to procure RECs produced within the geographic boundary that matches their consumption. These RECs should meet global quality standards as defined by international MRV systems in order for the voluntary market to adopt them for use.

**Alignment of national and international MRV requirements.** When designing domestic MRV disclosure requirements, it is beneficial to acknowledge and align systems with international leading practices. For instance, where GHGP recommends the use of REC tracking instruments to entities claiming the use of clean electricity, it is appropriate for domestic MRV systems to adopt similar requirements. This can be effectively seen in the context of the Philippines requiring obligated entities to make disclosure using RECs. Further alignment of international best practices for REC system design with national tracking systems may benefit domestic actors by encouraging operational efficiency.

**Appointment of a national implementor.** When implementing international tracking systems locally, government actors should appoint a national implementor to act as a Local Issuer and/or Qualified Reporting Entity (QRE). This entity is crucial for bridging the gap between global standards and local market conditions.

In the select markets that have domestic tracking systems, it is beneficial to appoint a centralised entity to oversee both the domestic and international tracking systems, to protect against risks of double counting and enhance market efficiencies between tracking systems used for different MRV goals.

**Regional Alignment.** Achieving regional alignment within BIMP/ASEAN could place the region on par with other regions like the EU and North America. This regional integration would create an efficient and consistent market. Achieving harmonised tracking systems that address the MRV needs of both

nationally obligated entities actors and international disclosing entities can strengthen the performance and efficiency of markets affecting multiple actors.

# 2.3. Tracking System Requirements

Internationally, the structures established by international MRV systems, such as GHGP and RE100, encourage the use of REC tracking systems by disclosing entities [17]. For a REC tracking system to be adopted and effectively utilised in this context, it should:

- a. Fulfil the requirements of entities reporting under international MRV systems;
- b. Include the core components of a Standard, Registry, and Issuer; and
- c. Either comply with best practices or be directly recognised by MRV reporting frameworks such as RE100 and SBTi.

Domestically, the only fixed requirement is that the REC tracking system aligns with the rules established by the national MRV system. However, adhering to general best practices—such as incorporating a standard, registry, and issuer—enhances the system's credibility in the international arena.

Currently, there is no standardised process for international MRV reporting frameworks to review domestic REC tracking systems. However, some systems, such as the APX TIGRs registry and I-TRACK's I-REC(E), are recognised for international use. This recognition allows nations to rapidly establish domestic REC markets using compliant tracking systems, ensuring their acceptance by commercial actors.

For countries developing independent REC tracking systems for use under international MRV frameworks, aligning with global best practices is advisable. However, even if a registry meets these requirements, recognition by international MRV frameworks is not guaranteed. For example, cross-border REC transactions outside the EU and North America are not currently recognised by frameworks such as RE100, despite occurring within approved registries. This is because MRV frameworks may impose additional rules on certificate usage beyond the technical operation of a registry. RE100, for instance, has set conditions for accepting certain cross-border bilateral REC transactions, requiring a uniform tracking system on both sides of the border.

This level of alignment is presently achievable only through existing REC tracking systems operated by international market providers. While a uniform registry and tracking instrument may be a prerequisite for enabling cross-border REC transactions under international MRV frameworks, meeting these technical criteria does not automatically ensure transaction acceptance.

Countries seeking to facilitate cross-border REC transactions in compliance with international reporting and MRV frameworks should weigh the advantages and disadvantages of engaging with global registry ecosystems. Conversely, nations that do not prioritise international MRV alignment may choose to maintain independent tracking systems tailored to their domestic policies.

## 2.3.1. Standard

Several core components must be integrated to establish a credible and functional REC tracking system that meets both domestic and international needs. These components ensure that the system operates with uniformity, transparency, and reliability, enabling it to effectively support RE claims and contribute to broader MRV objectives.

**Governance by a Standard.** The system must be governed by a Standard that provides a uniform set of rules for the issuance, transfer, and redemption of RECs, as well as for the management of stakeholders within the system.

**Robust technological infrastructure.** The system should record the issuance, transfer, and retirement of RECs on a robust technological infrastructure, known as the Registry, with added benefits provided by its ability to connect to external data environments, such as marketplaces and external registries.

**National integration through an authorised Local Issuer/QRE.** The system should be integrated nationally through the appointment of an authorised Local Issuer and/or QRE. This entity is responsible for implementing the domestic market, validating issuance data, and aligning national laws and goals with international standards.

The role of a Local Issuer may vary based on the rules of the given tracking system or MRV framework for which RECs are used, but it is critical to have a designated entity for overseeing and implementing the market.

The integration of these elements is necessary to ensure that the REC system functions effectively and meets the needs of all stakeholders; however, additional features may be required based on the specific market or MRV framework design.

**Principles for Standards**. While different tracking systems exist, those that are recognised international MRV frameworks generally operate within a defined set of rules, known as a Standard. Although individual tracking systems utilise different Standards, systems should seek to comply with governing best practice principles of fairness and neutrality, which are essential for gaining trust and acceptance among market stakeholders.

**Fairness.** Market participants should receive equal treatment under a Standard's governance and operational structures, with rules and fees uniformly enforced regardless of the actor's size or influence. Facilitating bodies, including registries, issuers and entities involved in oversight, should be prohibited from holding commercial interests in the market to ensure that no participant gains undue advantage over another, to avoid risks of market distortion.

**Neutrality**. While MRV systems may encourage specific purchasing behaviour, REC systems themselves should focus on tracking and providing transparency, rather than influencing the market. REC Market participants have varied preferences for RE sources and procurement strategies, which can influence the market value of RECs.

While MRV systems may suggest certain standards, procurement decisions should be left to the market participants without influence from tracking system operators, to preserve the autonomy of commercial actors and also to ensure the tracking system enables obligated entities (under compliance systems) to meet their specified consumption and disclosure targets.

# 2.3.2. Registry

Registries play a significant role in maintaining the integrity and transparency of REC tracking systems. As central data repositories, registries oversee account management, facility registrations, and the issuance, transfer, and redemption of RECs.

Credible registries are distinguished by clearly defined data capture and evidence requirements, often relying on revenue-grade meters or utility invoices to validate electricity production. Further, registries should be adaptable to accommodate for technological advancements and shifts in market conditions, such as the introduction of increasingly granular data capture and provision like those associated with 24/7 tracking.

Clear communication of roles and responsibilities is essential for all market participants. This can be achieved by making guidance materials and fee schedules publicly available and accessible. Nonetheless, registry operators must balance this transparency with the need to safeguard sensitive information, such as Personally Identifiable Information (PII) and specific electricity or REC consumption data, ensuring that such data is securely stored and accessible only to authorised individuals.

For a registry to be considered secure, credible, and ultimately gain adoption, it should align with all requirements imposed on it by the associated standard that governs its design and use. It should also be adhere to GHGP2 guidelines and other frameworks that identify quality criteria for tracking systems. Key considerations include [18]:

#### a. Unique Identification

Each EAC must have a unique tracking number and should only reside in one account at a time to prevent double counting.

## b. Traceability and Exclusivity

Registries must ensure that certificates are traceable and exclusively owned, eliminating the risk of double counting.

## c. Independence and Public Documentation

Registry management and ownership should be independent from market participants, with publicly accessible documentation to promote fairness and transparency.

#### d. Retirement Mechanisms

Registries must support certificate retirement to validate consumer claims and prevent their reuse.

#### e. Support for Multiple Markets

Registries should facilitate the import and export of certificates across different markets, and

support certificate retirement for entities outside the system's primary jurisdiction.

## f. Dispute Mechanisms

Clear procedures should be established to resolve disputes over the validity and enforceability of claims, particularly in complex markets with multiple instruments.

## g. Geographic and Market Boundaries

Registries must comply with the geographic and market boundaries set by regulatory authorities, namely by providing the ability to identify location of production (issuance) and use (redemption).

The technological infrastructure supporting a REC tracking system should be scalable and capable of integrating with new technologies. Scalability is essential for accommodating emerging trends like 24/7 timestamping and REC fractionalisation, which require precise tracking of generation, and the ability to make redemptions in sub-MWh increments.

International market operators, with established globally recognised registries [19], have designed their systems with these needs in mind, ensuring that their infrastructure can support future growth and technological developments. This approach ensures that these systems remain reliable and effective as global REC markets evolve. National actors designing stand-along systems should likewise consider scalability and adaptability features in order to facilitate long-term use and adoption of REC tracking systems.

# 2.4. Stakeholder Mapping in the Global and Local Context

Healthy REC markets are comprised of a robust ecosystem of stakeholders, each with considerably different functions. These can be broadly categorised into:

- a. oversight and implementation bodies, which set rules and enable transactions;
- b. market actors, such as buyers, sellers, and intermediaries; and
- c. ancillary entities, which are not directly involved in, but remain relevant to, the market.

This chapter defines each of the above categories, provides details on the sub-roles within each category, and concludes them in Table 21 that identifies which actors fulfil these roles.

# 2.4.1. Market Oversight

**Voluntary** oversight bodies include the corporate commitment frameworks, like RE100 and SBTi, disclosure systems, such as CDP and its associated scorecards, and broader consumption guidance, notably GHGP2, that set structure to how corporate consumers make clean electricity consumption claims.

Each of these entities is international in scope. As a result, any international or national entity that conducts disclosure in line with their respective guidance or rules will be bound to follow their guidance within the specific countries (BIMP/ASEAN) where they conduct procurement.

Compliance oversight bodies are generally national authorities responsible for drafting, updating, and

enforcing compliance regimes, such as RPS rules or CBAM standards. National compliance systems (e.g. the Philippines RPS) only guide national consumption rules, while regional or international compliance regimes (e.g. CBAM) will impact all entities in BIMP seeking to export goods into compliance-governed markets, like the EU. Compliance market regulators in the REC market are often different from regulatory entities overseeing carbon markets—creating a need to ensure close coordination when establishing regulations and harmonising operations of carbon and REC systems.

With respect to the alignment of voluntary and compliance REC markets, compliance market regulators are generally different from oversight bodies in the voluntary market. However, frameworks in voluntary markets and regulations in compliance markets often reference the same underlying operational principles, and should in principle reference each other.

In the Philippines, for example, the compliance market is regulated by the Department of Energy (DOE). At the same time, its voluntary market is guided by international frameworks like RE100 and SBTi, as is the case globally.

Actors in this category shape how REC buyers report their consumption of RECs. In some cases, they establish specific rules on the types of RECs companies can use, such as acceptable sourcing countries, the maximum age of generation assets supplying RECs, and other criteria.

**GHGP and Scope 2 Guidance.** The Greenhouse Gas Protocol (GHGP) Scope 2 Guidance is the most comprehensive and widely used framework for measuring and managing greenhouse gas emissions related to electricity consumption. It provides guidelines on how corporations should procure and report clean electricity, along with minimum quality criteria for evaluating EAC systems.

While GHGP does not directly regulate RECs, its guidelines inform corporate buyers and their supply chains on how to use RECs for emission reduction reporting.

**RE100.** This global initiative enables companies to publicly commit to sourcing 100% renewable energy for their operations worldwide. Participation is limited to the world's largest brands, with eligibility criteria outlined on the initiative's website. Committed entities must set clear deadlines for achieving full clean power consumption.

To drive greater corporate ambition, the RE100 Technical Criteria establish specific rules on the types of electricity and associated RECs companies must procure. These include requirements to source RECs from the same "market boundary" where the entity reports its electricity consumption and, more recently, mandates to procure from generation assets commissioned within the past 15 years.

**CDP.** CDP's global disclosure system promotes transparency and accountability in corporate environmental impact reporting and is the most widely used scorecard framework for businesses. Its reporting platform covers two-thirds of the global economy, enabling companies to disclose climate and environmental data through CDP systems.

The climate disclosure guidelines for CDP scorecards align closely with GHGP rules, including the requirement to validate clean electricity procurement through contractual instruments. In markets where

REC systems are active, companies must specifically use RECs to substantiate their renewable energy claims.

**CBAM.** Although CBAM is not a market actor, it establishes market oversight principles similar to those of RE100, GHGP, and other regulatory bodies. Guidance materials for full implementation are still being developed and will be released incrementally through 2025.

Preliminary policy documents indicate that goods imported into the EU will be taxed based on their carbon content, incorporating both direct and indirect emissions from production. Implementation will begin in 2026, initially applying indirect emissions calculations only to cement and fertiliser before expanding to other primary goods.

CBAM allows for two accounting methods: the location-based method, which calculates Scope 2 emissions using average grid emission factors, and the market-based method, which accounts for actual consumption values specific to the exporter. Under the market-based approach, PPAs are recognised as a valid means of reducing Scope 2 emissions at the production stage. This suggests that PPAs denominated in RECs—pending formal definition—will likely serve as a compliance instrument for exporters in BIMP, helping to lower emissions and mitigate tax liabilities.

**The Philippines' DOE.** The RPS and Renewable Energy Market (REM) rules provide the framework for the compliance market in the Philippines. The RPS rules define the obligations of mandated participants, including distribution utilities, retail suppliers, and generation companies with directly connected customers, while the REM rules regulate the issuance and use of certificates.

The Department of Energy (DOE) oversees the RPS and REM rules, while the administration of the registry is assumed by the Independent Electricity Market Operator of the Philippines (IEMOP). Further details will be provided in Chapter 3: Stakeholder Mapping and Country-Specific Analysis.

# 2.4.2. Market Implementation

Market implementing entities are those which enable the physical production of RECs and their delivery to end users. These include:

- a. standard-setting bodies like the I-TRACK, which develop the rules on how RECs are issued;
- b. registry providers, such as Evident or TIGRs, which provide the digital infrastructure in which RECs are issued, transferred, and ultimately redeemed; and
- c. Local Issuers, also referred to as national issuers or QREs, which conduct data validation and are responsible for ensuring REC standards/registries integrate with national laws and goals.

**Standards.** Standards provide the operating rules which govern the production of RECs and other environmental attribute products. In this context "Standards" refer to the guidelines that define a REC market's operations from point of issuance to redemption. They regulate registry and issuer activities, and are ultimately responsible for ensuring that a specific REC product is compliant and (in the best of cases) directly recognised as a valid procurement instrument by the oversight bodies previously described.

Standards can be used widely to develop multiple environmental attribute products, as is the case with the I-REC Attribute Tracking Standard and the associated Code for Electricity [20], or they can be product-specific, as is the case with the TIGRs Standard [21].

The I-REC Standard is used in all BIMP countries and accounts for about 90% of all voluntary market RECs issued in BIMP. The TIGRs Standard and Procedures covers Indonesia, Malaysia, and the Philippines and accounts for the remaining 10% of transactions [22].

**Registrars.** Registrars serve as central databases for various aspects of the REC market, including the registration of renewable energy installations, the issuance, transfer, and retirement of RECs. They maintain detailed records of account holders, RE installations, and the entire lifecycle of RECs, often referred to as the "single source of truth" for REC production and tracking. These records are updated in publicly accessible databases, with certain information, such as generation volumes, made publicly available, while other data, such as individual consumption, remains confidential to protect privacy.

Registrars operate under a defined governance structure, incorporating conflict-of-interest policies, change management procedures, and safeguards to prevent double counting, typically aligned with the standards outlined above. In BIMP, the two active voluntary market standards are I-REC and TIGRs, while the Philippines also operates a nationally developed registry, PREM, for compliance market transactions. I-REC transactions follow rules set by a Standard but are issued through a legally distinct registry (Evident), in accordance with its governance structure. In contrast, TIGRs functions both as a standard and a physical registry, both owned by APX.

**Issuers.** Issuers are third-party organisations appointed either by a national government or a REC registry (when national authorities choose not to designate an entity) to issue RECs. In the I-REC system, these entities are known as "Local Issuers," while in the TIGRs system, they are referred to as QREs. Their responsibilities include opening accounts on behalf of asset owners, processing issuance requests by validating submitted data, and ultimately issuing RECs within a registry.

In the TIGRs ecosystem, QREs primarily focus on data validation, with no role in market management, meaning they do not establish local contracts or operational rules. In contrast, local issuers in the I-REC system have greater authority, as they can introduce additional rules beyond those set by I-REC to align the market with domestic requirements. As a result, Local Issuers play a key role in bridging international standards, registry providers, and national governments. They serve as the critical link between globally established REC standards and the specific operational frameworks of individual countries.

Currently, none of the BIMP countries have designated national issuers for their voluntary REC markets, limiting government oversight of these systems. Appointing a local issuer is an essential first step towards establishing clearer market rules and strengthening domestic regulatory control. Figure 2.2 provides a global overview of countries that have appointed local issuers, along with the respective entities assigned in each nation.



Figure 2 2: Map of Local Issuers and Respective Appointed Entities Source: I-TRACK Standard Foundation

# 2.4.3. Market Actors

Having explored the overarching frameworks and implementing bodies that govern REC markets, it's time to turn our attention to the active participants who drive the transactions and dynamics within these markets. These market actors can be broadly divided into buyers, sellers, and intermediaries, each playing a crucial role in the procurement and utilisation of RECs. This section provides a detailed overview of these key players, exploring their motivations, preferences, and roles in shaping the REC market landscape.

**Buy-Side Market Actors**. The primary subcategories of voluntary market buyers are comprised of corporations with direct commitments to disclosure frameworks and their supply chains, which in some cases are required to use RECs to support the sustainability commitments of brands to whom they sell goods or services.

## a. Corporates

Corporates with load primarily engage in the REC market to achieve sustainability objectives under their CDP, RE100, or SBTi commitments. Corporates have distinct preferences for the types of electricity and RECs they consume, most often defined by factors like fuel type, REC vintage (year of power production), asset age, and geographic proximity to load.

Corporates are often more advanced than their supply chains with respect to REC procurement, because on average, larger companies have engaged in procurement for a longer time. More advanced buyers are defined by their ability to conduct more intricate procurement, such as purchasing through long-term PPAs, rooftop leasing, or Net Energy Metering (NEM) arrangements, and the like.

## b. Supply chain entities

Suppliers to corporates are increasingly becoming active beneficiaries in the REC market, primarily because brands require it of them. These suppliers are often asked by brands to disclose emissions data to global frameworks like the CDP, and are gradually being required to reduce emissions associated with production activities. Since supply chains are more recently being introduced to the REC market, they are generally less aware of how to conduct procurement and often prefer to buy simple unbundled products from brokers, traders, or utilities offering green tariffs.

#### c. Obligated entities

Under regulated compliance markets, buyers are identified by the associated policy or regulatory document, as are their associated procurement requirements. Under RPS and RPO policies, common buyers are electricity retailers (or distribution utilities, in the case of the Philippines' RPS, while in global trade agreement like CBAM, the declarants are importers of goods who may pass renewable energy obligations onto exporters. In both cases, the documents used to establish compliance mandates indicate the volume of RECs to be purchased—either directly, by indicating percentages of clean power, or indirectly but providing emission thresholds and allowing exporters to calculate individual procurement obligations in line with thresholds.

**Sell-Side Market Actors**. This section explores the key players involved in producing and delivering RECs to the market, including project developers, utilities, and various intermediaries. Each of these actors plays a crucial role in ensuring the availability and accessibility of RECs for buyers seeking to meet their RE goals.

#### a. Project developers and IPPs

Developers and IPPs that retain contractual ownership of RECs can create accounts in registries with which to register their generation assets, request issuance of RECs from Issuers, and ultimately sell them to buyers or intermediaries.

Their primary objective in the REC market is to secure additional revenue and (ideally) leverage it to finance new generation. By selling RECs, IPPs both generate additional revenue and support project bankability for new generation. They accomplish the latter by indicating to financiers that they are able to sell both the physical electricity and associated RE attributes, helping de-risk new generation capabilities.

#### b. Utilities and grid operators

Utilities can serve a broad range of roles in the REC market. They can be both a buyer and seller of RECs, and if they deliver physical electricity to potential buyers, they are also able to establish green tariff products, as is the case in both Indonesia and Malaysia—described in Chapter 4. Often acting as intermediaries between IPPs and end-users, utilities can play a critical role in collecting RECs, packaging them, and selling them on to supply chains and corporate end users.

Bundled utility products, such as green tariffs, are often preferred by less complex buyers, due to their relative ease of procurement and delivery—all of which can be handled by the utility.

## c. Brokers and traders

Traders buy RECs from project developers and resell them. Brokers mediate between buyers and sellers, but in contrast to traders, typically operate on a success fee rather than direct procurement and upselling. Both brokers and traders generally act as intermediaries between device owners and end-users.

In conducting transactions, they need to hold Participant accounts in the registry. Intermediaries work closely with REC registries and issuers, as well as with buy- and sell-side actors. They are a critical component of REC market development, as they handle some of the highest transaction volumes and are also often involved in policy discussions to ensure national REC ecosystem implementation is aligned with the requirements of international buyers.

It is important to note that, in countries where the utility is *not commercially involved in buying and selling RECs*, they can instead decide to function as the Local Issuer. However, this structure should only be considered in cases where the utility does not intend to sell RECs.

Among the most important decisions for utilities to consider is whether they will sell RECs or Issue them. It is not permissible for them to perform both functions, as this would create a conflict of interest and diverge from international practices designed to ensure competitive and fair markets.

The key advantage of a utility acting as a REC seller, as is the case in Malaysia, is that it can generate additional revenue by selling RECs from projects that it either owns, or from which it has contractual rights to sell RECs. However, the position as a market entity prohibits the utility from acting as a Local Issuer.

Conversely, by acting as a Local Issuer instead of a trader, as is the case with the utility in Thailand, the key advantages are that the utility can oversee the market and can support implementation functions alongside the government. This has proven successful in Thailand, where EGAT provides market oversight rather than commercial engagement in the market.

# 2.4.4. Ancillary Entities

Ancillary REC market entities are not essential to the operation of a REC market, but can significantly enhance the efficiency of transactions, introduce additional quality filters not included on RECs, and support wider alignment of REC market activities with national objectives in parallel areas, such as meeting NDC or Net Zero targets. Ancillary entities are described in more details as follows:

**Platforms.** Platforms are digital infrastructure, built and operated separate from a registry, but which often has Application Programming Interface (API) integration with a registry.

Entities that manage platforms are referred to as platform operators. Platform operators manage digital systems that are often accredited by, and extend the scope of REC registries, without serving as primary custodians of certificates.

Platforms can facilitate a range of services, from visualising certificate data to automating the issuance process. They can also enable market transactions like clearing of certificates by providing bid-ask or

auction environments. Their capabilities may include initiating the registration or management of organisations, users, or production facilities within a registry, thereby acting as market facilitators.

**Labels.** Labels provide supplementary information that is not included on the REC itself. This information is sourced and verified against standards or criteria set by an independent third party, known as a label authority. Organisations such as the Centre for Resource Solutions (CRS) and its Green-e certification act as label authorities, offering an additional layer of certification to RECs. These labels function as quality filters, assessing and disclosing the environmental and social impacts of the associated renewable energy projects.

While I-RECs serve as fundamental tracking instruments that verify RE generation and consumption, labels like Green-e provide evaluative claims on project quality. When a project meets specific criteria, a label is applied to the I-REC, enhancing its credibility and increasing its market value.

**Other environmental attributes, tracking systems, and policies.** Integrating carbon policies with REC programmes is essential to prevent market distortions and ensure credibility. A key risk is double counting, which arises when both carbon credit systems and RECs operate within the same country. To mitigate this, REC and carbon credit standards, along with registries, should collaborate to cross-check their systems, ensuring that certificates are not issued for the same MWh across multiple registries.

Equally important is aligning REC markets with emissions trading systems (ETS) to define the role RECs can play in helping obligated entities meet compliance requirements. This alignment can be achieved through structured consultation processes involving carbon and REC market stakeholders. These discussions, whether hosted regionally by development partners such as ACE or nationally through cross-ministerial bodies, are crucial for harmonising environmental market instruments. Such entities play a central role in ensuring the effective integration of carbon, REC, and other environmental markets.

Stakeholder Category	Stakeholder Type	Role & Importance	Examples (Geographic Scope)	Notes
	International Reporting Frameworks and Disclosure Systems	Define how end users consume and report against REC usage (frameworks) and provide a place in which to report actual numbers (disclosure systems)	<ul> <li>GHGP, framework (global)</li> <li>RE100, framework (global)</li> <li>SBTi, framework (global)</li> <li>CDP, disclosure system (global)</li> </ul>	
	Standards	Define rules for how a REC market operates, including guidance for registries, issuers, and market actors.	<ul> <li>I-REC Attribute Tracking Standards (used for voluntary transactions in all BIMP nations and 40+ other countries)</li> <li>TIGRs Standard (used for voluntary transactions in Indonesia, Malaysia, and Philippines, and 8 other countries)</li> </ul>	
Oversight and Implementation	Registries	Comprehensive REC database.	<ul> <li>Evident Registry (used for I-REC globally)</li> <li>TIGRs (used for TIGRs globally)</li> <li>REM (used for compliance market in the Philippines)</li> </ul>	

Table 2-1: Mapping of Stakeholders' Roles

Stakeholder Category	Stakeholder Type	Role & Importance	Examples (Geographic Scope)	Notes
	National Oversight Body (regulators and ministries)	Set and enforce rules associated with policies such as RPS or ETS in countries with compliance markets. Can also informally provide input on market development by establishing guidance materials to govern (but not necessarily regulate) the market.	<ul> <li>DOE (Philippines)</li> <li>Energy Commission of Malaysia (peninsular) in collaboration with ministry representatives and regulators in Sabah and Sarawak</li> </ul>	
	National/ Local Issuers (implementing arm of oversight body)	Central Issuers (in countries that do not select an entity) or Local Issuers in countries that appoint one. They issue RECs based on data provided by asset owners to demonstrate production.	<ul> <li>Green Certificate Company (GCC)(Central Issuer, active in all BIMP countries for voluntary I-REC markets)</li> <li>IEMOP (Local Issuer for the Philippines REM market)</li> </ul>	Indonesia, Malaysia, and the Philippines are each evaluating entities to empower as Local Issuers for the voluntary market.
	Asset owners, IPPs, developers, and utilities	Generate electricity and eligible to request issuance of (and sell) RECs.	Asset owners of all sizes are engaged in each of the BIMP nations.	Issuance volumes by country are listed in Chapter 4.
	Brokers and traders	Facilitate REC transactions between buyers and asset owners	50+ entities and their contact details can all be found at the following link: https://www.irecstandard.org /download/participant-conta ct-list/	While headquarter locations vary, most entities supply in each BIMP country, potentially with the exception of Brunei Darussalam due to low liquidity.
Market Actors	Corporates	Achieve sustainability objectives.	Fortune 500 companies, and 1,000 corporates participating in RE100, SBTi, and CDP reporting.	Often advanced buyers, and interested in bundled transactions like PPAs.
	Supply Chains to Corporates	Purchases RECs to meet client sustainability requirements, often without having their own public commitments.	Supply chains to SBTi companies with load in BIMP—currently a small subset of REC buyers, given that corporate requirements have not yet fully addressed supply chain decarbonisation.	Often less advanced as buyers and prefer unbundled, year-on-year transactions rather than long-term contracts.
	Platforms and marketplaces	Manage digital systems extending REC registries, such as by providing clearinghouse functions.	mGATS in Malaysia which is developed and operated by TNBX	Other markets and platforms exist, but the example was chosen based on ASEAN/BIMP focus.
Key Ancillary Entities	Labelling schemes	Provide additional certification layers	EKO Energy (global) and Green-e (Global, with occasional geographic restrictions).	
	Carbon market actors	Integrate REC considerations into carbon policies with REC programmes		

# 2.5. Commercial Consideration and Disclosure in REC Ecosystem

RECs enable the capture and transfer of environmental attributes from renewable energy generators to designated end-users. The exclusive right to claim these environmental benefits is essential to maintaining the integrity of REC markets and is mandated by all major international reporting and disclosure frameworks.

For a REC system to be recognised as credible by international actors, it must verify—through documented evidence—that REC holders are the sole proprietors of the associated environmental attributes. This verification occurs primarily during asset registration, when an entity submits documentation to the Local or Global Issuer, confirming that the registrant is the rightful owner of the environmental attributes in question.

## 2.5.1. Ownership Principles

Ownership of environmental attributes is typically established through commercial agreements, such as power purchase agreements (PPAs), regardless of whether they involve a power producer and an end consumer or a power producer and a utility. While some energy sector policies provide guidance on attribute ownership, it is these contractual agreements that define and operationalise the terms, specifying who holds the rights to environmental attributes under each contract. PPAs commonly serve as the primary evidence submitted by registrants to issuers to validate their entitlement to REC issuance.

Ownership terms can be structured through either bilateral agreements or standardised contract templates. Bilateral agreements involve direct negotiations between parties, allowing customised arrangements regarding environmental attribute ownership and associated responsibilities. These agreements define key aspects such as which party holds ownership of RECs, whether any entity is responsible for REC issuance, and who, if anyone, is the designated recipient of REC redemptions.

Standardised contract templates, such as uniform PPAs, are particularly useful where consistency across multiple agreements is required. These contracts often provide predefined options for attribute allocation. For instance, an independent power producer (IPP) may sell both electricity and RECs to a utility at a higher rate or opt to sell only the electricity while retaining RECs for separate sale to other entities. Template offtake agreements are commonly used in markets where a single buyer or utility establishes uniform commercial terms across multiple IPPs. Regardless of the specific structure, the key requirement is that the contract explicitly identifies REC ownership, whether assigned to the asset owner or the electricity off-taker.

Although PPAs are commonly used to establish ownership, there is no universal standard dictating which entity should receive it. Some PPAs designate the generator as the REC owner, while others assign ownership to the electricity purchaser. Ideally, this should be determined through bilateral negotiations before contract execution. However, many legacy PPAs were drafted before REC ownership was widely recognised as a critical contractual element, meaning they often lack explicit provisions regarding attributes, RECs, or carbon rights.

**Determining ownership**. For new contracts and PPAs, it is essential to define REC ownership from the outset, either through direct negotiation between the parties or by adopting standardised national template contracts. The contract should explicitly state (i) which party will own the environmental attributes and, if applicable, (ii) which party will be responsible for managing issuance, transfer, and final redemption. Incorporating these provisions in new PPAs helps prevent future ownership disputes.

For contracts established before the REC market's introduction, stakeholders should first review local precedents, often drawn from carbon markets. Many legacy PPAs specify that a particular entity—typically

the power generator—has the right to register the asset and request carbon credit issuance. In such cases, it is common practice to extend this logic to RECs, assigning ownership to the independent power producer (IPP).

Where legacy PPAs lack clear provisions, the next step is to examine international examples, beginning with historical REC issuance and then referencing global carbon market precedents. If domestic PPAs do not mention REC, carbon, or environmental attribute ownership, stakeholders often look to regional neighbours or countries with similar market structures for guidance. Observationally, the most common approach in cases where historical PPAs do not explicitly address REC or carbon ownership is to assign ownership to the power generator or IPP. This approach aligns with contract structures and issuance processes used in carbon markets, particularly within the Clean Development Mechanism (CDM). However, ownership varies by jurisdiction and should be evaluated on a case-by-case basis when contracts lack explicit provisions.

**Avoiding ownership debates and associated risks**. Clearly defining environmental attribute ownership is essential to preventing disputes that could undermine REC market integrity, financial value, and enduser confidence. To avoid conflicts, stakeholders should adhere to contractual provisions that explicitly define ownership. Where contracts are silent on this matter, retroactive ownership claims that contradict established issuer practices in the country should be avoided.

When a contract clearly specifies environmental attribute ownership, its terms are binding and should be honoured by the parties and presiding courts. This applies to both energy contracts and those specifically addressing environmental attributes, as initial ownership designation is fundamental to REC registration and issuance. In the ASEAN region, legacy PPA contracts and subsidy schemes often do not address REC ownership. Public disputes over ownership can devalue associated RECs, making it critical for parties to reach a consensus where contracts lack explicit terms. This can be achieved through direct negotiations, consulting national REC guidelines, or engaging with local or global issuers to establish ownership based on existing practices or precedents.

The prevailing practice for PPAs that do not define ownership is to assign REC rights to the asset owner. This approach aligns with precedents from carbon markets, which have influenced REC market structures, and supports the broader goal of encouraging developers to reinvest REC revenue into expanding renewable capacity. While courts or regulators could theoretically reassign ownership in contracts that do define it, doing so is rare due to the risk of market devaluation. For utilities seeking to act as REC vendors, the recommended approach is to structure ownership terms in future contracts rather than attempting to claim RECs from past agreements with IPPs. Prioritising new contracts over legacy ones helps maintain market confidence and preserves trust in both the REC system and utility off-takers.

## 2.5.2. Transaction structures

RECs can be transacted in various structures by different categories of market participants, depending on national energy sector regulations and commercial preferences. Transactions can occur either alongside physical electricity or independently. In a \*\*bundled\*\* transaction, buyers acquire both electricity

and RECs from the same source. In contrast, an \*\*unbundled\*\* transaction involves purchasing RECs separately from electricity, allowing buyers to source each from different providers.

Most REC systems permit both transaction types, with the choice depending on the end user's preferences and the feasibility of contracting within national regulations. Some countries have legal frameworks that facilitate bundled REC transactions through PPAs, while others impose restrictions. Consequently, the availability of bundled or unbundled structures varies by jurisdiction based on energy sector laws and regulations.

Table 2.2 provides a structured overview of the procurement options available to REC market participants, detailing the key stakeholders involved, advantages, disadvantages, and ideal use cases for each approach. This information helps both buyers and sellers make informed decisions on REC market participation based on their specific needs and strategic objectives.

Procurement option (Bundled / unbundled)	Description	Advantages	Disadvantages	Parties to Transaction
Bilateral REC -only sale (unbundled)	An entity that registers and issues RECs sells them directly to the end user, independently of the generated electricity.	Straightforward process, accessible to all electricity users including individual households and dlobal comporations with		Attribute owner     End user
Multilateral REC -only sale (unbundled)	A third party acquires RECs from the original owner and resells them to an end user, independently from the generated electricity.		Buyers face extra costs atop electricity, as vendors sell RECs separately from physical electricity. Some ambition frameworks rate this as a less ambitious environmental strategy, favouring bundled options as medium- and long-term procurement strategies.	<ul><li>Attribute owner</li><li>Broker or trader</li><li>End user</li></ul>
REC sale through marketplace or platform (unbundled)	A digital platform, certified by a REC standard and connected to a REC registry via API, facilitates the sale of RECs. The marketplace or platform itself sets rules for listing RECs and buyer participation, allowing buyers to manage REC procurement in one location. These rules are used as the basis for Standards to accredit marketplaces.	flexible purchasing terms.		<ul> <li>Marketplace owner/operator</li> <li>Attribute owner with permission to list on marketplace</li> <li>End user with permission to purchase from marketplace.</li> </ul>
Self-Consumed Power + RECs (bundled)	An entity generating electricity uses the electricity on-site and/or supplies excess to the grid. Common structures include net energy metering schemes and rooftop leasing schemes. The asset owner can either use the associated RECs for their own reporting or (if they do not report sustainability features of their energy) they can sell the RECs into the market. They must choose either self-consumption or selling the RECs for profit.	If the reporting entity owns the generator the RECs are essentially free, aiding in transparent reporting.	Self-consumption of RECs prevents their sale to third parties. Alternatively, sale of RECs prohibits the entity to make claims of their use for their own reporting.	<ul> <li>Asset owner</li> <li>Third-party buyer (optional)</li> </ul>
Corporate PPAs (bundled)	In a corporate PPA, the terms of electricity sale are set between an IPP and an end user. RECs serve as a tool for transferring environmental attributes from the IPP to the end user. These PPAs can be either physical, with a direct connection between the IPP and end user, or virtual, using grid settlement in combination with RECs and (in some cases) contracts for differences on electricity prices.	Highly regarded globally for showing active buyer involvement in generation, potentially offering lower REC costs in long-term agreements.	High initial costs and long contract durations (often over 15 years), making it more suited for major power consumers with long-term consumption horizons.	<ul> <li>IPP</li> <li>End user</li> <li>Grid Operator (for virtual PPAs)</li> <li>Transaction advisors</li> </ul>
Utility Green Tariff Product (bundled)	Utility Green Tariff products combine physical electricity from a utility or retailer with RECs, enabling the end user to claim clean electricity. They offer quick REC procurement, often with short-term commitments and minimal contract complexity.	Straightforward transactions, potentially directly supportive of national energy goals.	Often come at a premium price, and availability is limited by country and utility.	<ul> <li>Utility/Retailer</li> <li>End User</li> </ul>

Source: Authors

REC market participants can trade RECs through several methods, each with distinct operational and financial characteristics. The primary approach is \*\*direct contracting between generators and end users\*\*, which eliminates intermediaries and allows for a streamlined transaction process.

In this model, an independent power producer (IPP) sells RECs directly to an end user through a contractual agreement. To facilitate this, the IPP must hold a \*\*Registrant Account\*\* in a REC registry, while either the IPP or the end user needs a \*\*Participant Account\*\* for redemptions. Typically, the IPP manages issuance, account administration, and redemption fees.

Under this arrangement, the end user pays the IPP directly for the agreed REC value. In most cases, the IPP requests issuance of the RECs from the Issuer and then redeems them on behalf of the end user, using its Registrant and Participant Accounts. This structure provides a direct and transparent transaction process, ensuring that environmental attributes are appropriately transferred to the end user.

+ *Advantages*: Provides maximum control over transactions, enabling direct negotiation of prices and contract terms.

- *Disadvantages*: Requires IPPs to engage directly with end users, manage fees, and handle registry accounts and redemption processes in-house.

√ *When to Use*: Best for vendors with established end user relationships, such as in PPAs or solar rooftop leasing.

\* *Note*: Bilateral transactions can be used for both unbundled and bundled deal structures.

**Brokers, green tariffs, marketplaces, and other intermediaries**. IPPs can work with third-party brokers or traders for REC sales. Brokers connect buyers and sellers, while traders often assist more in asset registration and issuance. Broker and trader models provide the highest degree of handholding and support for buyers and sellers. Newer models like marketplaces and utility aggregation can simplify transactions and human time used to transact. For instance, marketplaces may ease asset registration and connect buyers and sellers, while utility models function like brokers or traders with set demand and pricing.

+ *Advantages*: Reduces effort for IPPs, as intermediaries handle end user engagement, and the REC issuance and delivery process. Marketplaces or utility aggregation models often provide more transparent pricing, while broker/trader models provide more support on selection of appropriate RECs to meet downstream reporting requirements.

- *Disadvantages*: Intermediaries take a cut of the REC sales, which might reduce IPP revenue. Long-term contracts can present opportunity-cost risks and limit control over buyer interactions.

 $\checkmark$  *When to Use*: Ideal for IPPs less involved in the REC market, particularly smaller IPPs with limited REC portfolios. Also ideal for buyers that are interested in conducting annual procurement, or that have variable demand or multiple demand hubs in different countries.

**Self-consumption and the importance of single entity claims**. Where entities own their own renewable assets, two primary options exist. If the entity wishes to claim the use of renewable electricity, then it

must issue RECs and redeem the RECs in its own name. This is an established practice to ensure no double claims occur. Conversely, in cases where a facility owner (e.g. a factory) has installed renewable generation facilities *but does not intend to publicly claim to use renewable electricity*, it may choose to request REC issuance and sell them to a third party using any of the above-mentioned transaction structures.

\**Note*: Selling a REC transfers all associated environmental benefits or "green claims" to the REC buyer. This means that IPPs who sell their RECs cannot claim the environmental benefits of their electricity; these claims go to the end user who redeems the REC. This means that entities that self-generate renewables should decide whether to benefit from claiming the use of renewables, *or* benefit from selling the RECs, but not both.

**Contractual considerations**. In contracts transferring clean electricity from IPPs to corporate users (like rooftop leasing or corporate PPAs), it is important to specify who manages REC settlements and pays related fees. Corporate PPAs often recognise the end user as the holder of environmental benefits, but usually assign REC registration and redemption responsibilities to the IPP. This includes determining which party covers associated fees. While there's no one-size-fits-all approach for assigning these tasks, clarity in the PPA about who handles the REC settlement process is essential, as it involves managing the necessary accounts for obtaining and using RECs.

## 2.5.3. Establishing REC Prices

Standards, registry operators, and issuers should not reveal any price-related information. This is the case because their involvement in pricing could distort market values or unfairly favour certain participants. Therefore, sellers need to carefully evaluate offers from potential buyers.

**Supply and demand**. The primary driver in REC pricing is local supply and demand. The REC's price largely depends on the country of issuance, with prices tending to be higher in countries with limited renewable resources [23].

**Technology preference**. Preferences for technology types and fuel sources among end users vary significantly. Demand for RECs from zero-carbon projects, such as wind or solar, may lead to price differentiation, when compared to biofuels or feedstock. Price signals by fuel type can often be noted through market platforms that provide some degree of transparency.

**REC vintage**. The power generation date indicated on a REC is referred to as its vintage and often influences its price. Current frameworks suggest aligning REC vintages with electricity consumption periods. RECs maintain their highest value up to 12 months after the date of generation, decreasing in value after 18 months. RECs older than 18 months by vintage often decline heavily in value [24].

**Age of generation assets**. The commissioning date of a generation unit often impacts prices of associated RECs. This factor has grown in relevance in recent years given the publication of updated guidance from RE100, which establishes guidance on 15-year (or younger) commissioning dates for generators. This often means that newer projects (or ones soon to be commissioned) benefit from higher REC prices [25].

Quality labels and premium product definitions. RECs serve as neutral instruments for tracking factual

details (e.g. source, fuel type, asset age) about RE generation, without judging the sustainability or quality of generation. They are issued solely for tracking and transparency, providing a factual statement about the origin and ownership of electricity.

In contrast, quality labels, such as Green-e or EKOenergy, evaluate aspects of generation and/or consumption that RECs do not cover. Quality labels generally require that a REC has first been issued for specific generation, and can then be layered on top of the underlying REC to provide additional details (most often evaluative) that are not inscribed in the REC itself.

Quality labels assess RECs under various sustainability and quality criteria that are developed by the owner of the quality label. This evaluation helps buyers understand the environmental and quality impact of a project. Green-e, as an example, adds evaluative claims to RECs, assessing the environmental impacts of specific power plants. Quality labels support end users in identifying specific types of projects that meet third-party quality control features, and for asset owners that do meet these quality criteria, labels can support increased REC prices [26].

When establishing REC prices, sellers need to consider both the inherent value of the RECs in the market and the costs associated with generating and transacting them. The key cost components that sellers should factor into their pricing decisions to ensure they receive fair compensation for their RE attributes.

**Cost considerations for REC sellers**. Sellers need to account for the costs involved in creating and trading RECs, including any fees or pricing structures from intermediaries and the REC's ultimate value. This guide, like others, refrains from influencing the market's commercial dynamics. Therefore, it outlines typical transaction expenses and factors that shape REC prices, without specifying exact numbers.

**Transaction costs for RECs**. Entities such as standards bodies, registries, and issuers should establish and publish consistent fee schedules. Marketplaces adhering to reputable standards and connected to registries via APIs should do the same.

Fees for REC issuance. These typically consist of:

- a. Fixed fees, which cover account opening, Know Your Customer (KYC) verification (requiring documentation such as business registration records, proof of address, and identification documents), and an annual account maintenance fee; and
- b. Variable fees, which depend on specific activities, including asset registration (calculated based on the generating asset's capacity) and charges per REC issued and redeemed.

Fees for transactions associated with the I-REC Standard can be viewed on their public fee schedule.

Additional costs. Sellers working through intermediaries may avoid direct issuance fees, as traders often cover these costs as part of their agreements with IPPs or attribute owners. However, intermediary fees can vary significantly, and sellers should weigh these costs against REC bid prices. Some intermediaries operate on revenue-sharing models, while others purchase attributes at fixed prices for resale. Similarly, marketplaces and trading platforms have diverse pricing structures and commercial arrangements, which are typically independent of issuers and standards. As such, attribute owners should carefully assess

these factors when planning to sell RECs..

# 2.5.4. End-Use and Disclosure Principles

Voluntary disclosure to international reporting frameworks such as RE100 and SBTi is the primary driver of REC demand in global markets. These frameworks influence the purchasing behaviour of both buyers and sellers, making their guidelines essential for establishing a REC market that meets global acceptance. GHGP2 serves as the foundation for corporate greenhouse gas (GHG) accounting, setting key quality criteria for energy attribute certificates (EACs) and other market-based instruments. It provides the framework for corporate reporting on clean electricity usage within carbon inventories [27].

Expanding on the best practices established in GHGP2, "layer two" frameworks—such as RE100 and SBTi—introduce additional criteria and guidance for corporations. Companies participating in these initiatives must report using standardised CDP scorecards and adhere to stricter procurement requirements compared to organisations that follow only GHGP2 principles.

Disclosure frameworks recommend market-based accounting methods for accurately measuring Scope 2 emissions [28], universally recognising RECs, PPAs, and similar contractual instruments. However, each framework applies specific criteria aligned with its objectives. Best practices include: (i) procuring RECs within the same geographic region as the electricity consumption; (ii) ensuring REC vintages do not exceed 21 months from the energy use period; and (iii) redeeming RECs to prevent double counting. Where uncertainties arise, frameworks consistently reference GHGP2 as the industry standard. GHGP is undergoing updates at the time of writing, which may influence global accounting practices, preferred REC structures, and related market mechanisms.

Beyond the general recommendations, voluntary disclosure frameworks provide specific guidance on several key aspects of REC procurement, including the location of generation, vintage, and asset age. Understanding these nuances is crucial for REC buyers and sellers, to ensure their transactions align with the requirements of the chosen frameworks and contribute meaningfully to their sustainability goals.

**Location**. Market operators, such as the I-TRACK Standard Foundation, already facilitate cross-border transactions, allowing a REC produced in Country A to be redeemed against load in Country B. However, frameworks like RE100 and SBTi often require entities to procure RECs linked to power generated within the same market boundary as the associated load for credible electricity consumption claims. Ignoring this requirement can result in reporting issues or compliance violations, which end users must carefully assess. It is essential for end users to review the specific requirements of the frameworks they report to or have publicly committed to following.

**Vintage**. The 'vintage' of a REC marks the year of RE generation. For valid voluntary reporting, this should align closely with the electricity consumption year. While no standard exists for 'reasonably close,' programmes like Green-e recommend a 21-month window, and other entities often require narrower procurement horizons between generation and consumption periods. End users should check guidelines of their chosen market and disclosure systems to ensure the suitability of the REC vintage they are looking to procure.

**Asset age**. Newer RE assets are often more efficient and contribute directly to renewable expansion, while older assets support grid diversity and reliability. The choice of asset age should align with the end user's sustainability objectives. In 2022, updates to the RE100 Technical Criteria introduced new requirements for RE100-reporting entities, mandating that RECs used for reporting must originate from assets commissioned or repowered within the past 15 years.





# Chapter 3 Stakeholder Mapping and Country-Specific Analysis



Two primary compliance structures govern renewable energy certificate (REC) markets: Renewable Portfolio Standards (RPS) or Renewable Purchase Obligation (RPO) systems, which mandate renewable energy consumption, and full disclosure or all-attribute-tracking systems, which require issuance and transparency rather than procurement.

RPS policies establish specific obligations for electricity suppliers and utilities, requiring them to source a defined percentage of their energy from renewable sources. The Philippines' RPS framework is detailed in several key policy documents, including the RPS On-Grid (2017) and Off-Grid Rules (2018), which set foundational mandates, and the Renewable Energy Market (REM) Rules (2022, second issue), which define implementation procedures. Other key Department of Energy (DOE) circulars include:

- a. DC2017-12-0015 (On-Grid RPS),
- b. DC2018-08-0024 (Off-Grid RPS),
- c. DC2019-12-0016 (Renewable Energy Market Rules),
- d. DC2021-10-0032 (REM Manual), DC2022-06-0019 (Interim REM Operations),
- e. DC2022-09-0030 (RPS Minimum Annual Incremental RE Percentage, increased from 1% to 2.52%),
- f. DC2023-05-0014 (Revised Off-Grid RPS Rules),
- g. DC2023-05-0015 (Amendments to On-Grid RPS Rules), and
- h. Energy Regulatory Commission (ERC) Resolution No. 8 (2024), which sets a REC price cap of PHP 241.56/MWh.

Unlike RPS models, full disclosure and all-attribute-tracking systems do not impose mandatory procurement. Instead, they focus on tracking energy generation at the source. All-attribute-tracking systems issue an energy attribute certificate (EAC) for all electricity generated, whether from renewable or non-renewable sources, ensuring comprehensive traceability. Examples include the New England Power Pool Generation Information System (NEPOOL GIS), PJM Generation Attribute Tracking System, and New York Generation Attribute Tracking System (NY GATS). Full disclosure systems take transparency further by publicly disclosing the composition of consumed electricity. The Dutch Full Consumption Disclosure Scheme, which mandates national-level reporting, is an example in the EU [29]. To date, no full disclosure or all-attribute-tracking systems exist in Asia.

Currently, the Philippines is the only BIMP (Brunei, Indonesia, Malaysia, Philippines) and ASEAN nation with an RPS-driven REC market. Indonesia is evaluating a potential RPS framework, but no implementation has occurred. While voluntary REC markets dominate the region, mandatory compliance structures will become increasingly relevant. Notably, from 2026, all BIMP nations exporting goods to the EU will be subject to the Carbon Border Adjustment Mechanism (CBAM). Establishing well-functioning REC markets is critical to ensuring that regional exporters have the necessary tools to meet EU compliance requirements as they come into force.

Given that the Philippines currently operates the only compliance-driven REC market in the region,
understanding its interaction with voluntary REC trading is essential. The following section examines the design, activity, and regulation of the BIMP REC market, with a focus on the interplay between RPS mandates and voluntary market dynamics.

#### 3.1. Brunei Darussalam

#### 3.1.1. Overview of National REC Market

Brunei Darussalam currently provides access to REC tracking infrastructure through the I-REC ecosystem. As is most often the case in nascent REC ecosystems, the market is implemented by non-profit actors with limited direct government involvement. To date, this has provided adequate functionality to support market actors in issuing RECs and redeeming them against load within Brunei Darussalam.

More can be done to educate potential users in the industrial sector on the fact that an active REC market already exists, and how to engage in it. From there, national authorities can, at any time, take control of the domestic market by appointing a Local Issuer to oversee the domestic REC ecosystem, including promoting the use of standardised PPA template to clarify REC ownership.

While training activities and appointment of a Local Issuer can support more robust market development, these steps are not required for the market to function. Rather, these activities would simply promote deeper government involvement and increased use of the current system.

**Market structure and history of implementation, and positioning in ASEAN**. Brunei's REC market is still in a formative stage, displaying limited asset registrations and liquidity (Table 31 and Table 32). The market is implemented by the non-profit I-REC Standard Foundation, which approved local I-REC issuance on 27 June 2022. Market implementation and asset registration carried out by the Central Issuer, GCC, and the Foundation remains open to appointing a a Local Issuer to take on ownership and operation of the market, pending a national appointment. Doing so could be a low-hanging fruit for national actors to take leadership in the development of the national voluntary REC market.

Historically, the country was approved for I-REC issuance based on a request to open the market, and the subsequent submission of a Country Assessment Report by Brunei Shell Petroleum [30].

In terms of market potential, the limited peak installed renewable capacity in Brunei Darussalam restricts total issuance potential, while anecdotal evidence, based on interviews with brokers and traders active in the region, also suggests limited demand-side requests from corporate entities.

These two features indicate limited potential for growth in liquidity—signalling a likelihood that transactions will remain bundled with physical electricity (for self-consumption) in the near future. Significant increases in both installed generation capacity and end user demand may be required to increase REC transaction liquidity for unbundled procurement.

Currently, the market serves voluntary demand. Given that the national economy is largely tied to energy exports, it is feasible that in the future, hydrogen exports could become a new source of local demand for RECs. Regardless of whether hydrogen is used domestically or exported, RECs are expected to serve as a

key instrument for certifying and supporting the production of "clean" hydrogen products, as outlined in the I-TRACK(HX) Product Code [31].

In addition, and given the country's proximity to Sabah and Sarawak, physical electricity imports and exports between Brunei Darussalam and Malaysia could in the future open REC import and export economies, particularly if local demand exceeds available supply.

I-REC	Vintage	I-REC Issuance Volume per technology Solar
	2022	4.420
	2023	3.020
TIGRs	2022	0
	2023	0

#### Table 3-1: Brunei Darussalam's Total Issuance Volumes for 2022 & 2023 Vintage

Source: I-REC (Evident) and TIGRs registries.

#### Table 3-2: Brunei Darussalam's Total Redemption Volumes for 2022 & 2023

	Redemption Date	I-REC Redemptions per technology				
EC		Solar	Bioenergy	Hydroelectric		
<u> </u>	2022	4.090	1	2.543		
	2023	2.074	0	2.314		

Source: I-REC (Evident) registry. Note: To the knowledge of the authors, TIGRs redemption data is not publicly available.

**National objectives in related areas, such as RE, NDCs, Net Zero, and similar**. The country has ambitious national objectives in line with global sustainability goals. The 2020 Brunei Climate Change Policy has set targets to increase RE capacity to 30% of the total power generation mix by 2035, alongside a GHG emission reduction target of at least 10%. The document also establishes plans to adopt carbon pricing by 2025 [32].

These objectives align with Brunei's NDC pledge to reduce economy-wide total GHG emissions by 20%, relative to Business-As-Usual (BAU) levels, by 2030 [33]. While NDC targets for the power sector are based on installed capacity—and are therefore unaffected by REC transactions, which look to volumetric settlement—NDC targets beyond the power sector, such as for economy-wide decarbonisation, can be partially achieved and tracked by encouraging domestic consumption of RECs in the non-power sector.

To the extent that Brunei wishes to address decarbonisation in specific industries, it can consider educating and encouraging corporate electricity consumers to consume RECs and report associated emission reductions.

#### 3.1.2. REC Market Potential and Regulatory Context

**REC market potential**. The local REC market has the greatest potential to increase liquidity and market actors as new generation is built. Based on national generation potential, it is likely that solar will be the primary driver for future REC market growth, with estimates suggesting that nearly 103.9 GW of installed capacity (equating to 143.2 TWh of power generation) is achievable if all suitable land is utilised [34].

The National Renewable Energy Laboratory (NREL) has estimated that Brunei has around 2,885.2 km<sup>2</sup> of land suitable for this development, with technical potential particularly high in urban areas like Bandar Seri Begawan and Muara port. At the time of writing, only 30% of the renewable peak installed capacity has been registered in an EAC registry [35]. This provides positive signals in terms of potential market development from a supply perspective.

As there is no mandatory REC market in Brunei, demand is currently driven by voluntary corporate procurement, primarily from multinational companies seeking to meet their sustainability targets. The oil and gas industry, a major contributor to Brunei's economy, is expected to play a significant role in driving REC demand, as companies in this sector seek to offset their carbon footprint.

Additionally, the introduction of NEM and voluntary reporting for RE could further stimulate both supply and on-site consumption of RECs. Net metering allows facility owners to generate their own renewable electricity and self-consume the associated RECs, enhancing transparency and reporting, which could be particularly attractive to oil and gas firms with on-site generation capabilities.

Given the current limited renewable capacity and high demand potential, Brunei is likely to be a net importer of RECs, especially clean hydropower from Sarawak, facilitated by planned interconnectors under the One-Borneo interconnection partnership. While cross-border REC transactions are not yet recognised by major reporting frameworks, there are opportunities for Brunei Darussalam and its neighbours to establish agreements and mechanisms for facilitating REC imports and exports across Borneo. In the future, as the country's renewable generation capacity grows, there could also be potential for exporting RECs from small-scale solar projects to meet non-hydro demand in Sarawak or Sabah.

**Regulatory context**. There are currently no stand-alone REC policies in Brunei. This is common in early and mid-maturity REC markets, given that REC policies and regulations are often added into energy market policies, rather than developed as stand-alone policies until market complexity grows.

Until a wider governance structure or steering committee is in place, it may be counterproductive to develop a stand-alone REC policy in Brunei. Instead, adjustments to existing commercial documents (e.g. PPAs) and policies should take priority, seeking to establish and better define attribute ownership, and provide guidance on how different entities can and should interact in the REC market.

With respect to existing policies relevant to the REC market, Brunei's National Climate Change Policy (BNCCP), under Strategy 4, focuses on RE. It emphasises the importance of attracting foreign direct investments (FDI) in renewables. To achieve the RE targets, Brunei will focus on large-scale solar, including through public-private partnerships, exploring RE policy for energy-intensive industries, as well as small-to medium-scale solar strategies involving rooftop solar installations and existing net-metering programmes.

In addition to the objectives set in the BNCCP, the *Electricity Order 2017* and the *Brunei Energy White Paper 2014* guide electricity and energy sector activities. Existing renewable policies include NEM, which allows excess solar-generated electricity to be exported to the grid in exchange for credits to offset electricity bills, and VRRE, which requires customers to report their solar PV installations.

RECs can be used to denominate NEM transactions, including for self-consumption by the asset owner or for onward sale to third parties. Incorporating clear language in NEM documentation to define how RECs are used—along with associated ownership structures—would be a relatively straightforward step to improve clarity for participants.

For voluntary RE reporting, it is essential that disclosure principles align with future REC market design. This includes clearly defining the instruments that can be used to substantiate related disclosures.

**Documents national actors may wish to review for REC market alignment**. In its most recent action, on 27 April 2023, BNCCC officially released the Directive on the Mandatory Reporting on Greenhouse Gas. A press release from the Prime Minister's office notes that the directive states: "Commencing this year [2023], all facilities that emit and/or remove GHG including those within the activity chain, consisting of Government departments, private sector companies, are required to report their greenhouse gas on a quarterly and annual basis. This is in line with the objective of Strategy 9: Carbon Inventory of the BNCCP in enhancing transparency and completeness of our national GHG accounting. The Directive serves as a clear demonstration of the Government's dedication to transparency and accountability, in addition to enabling Brunei Darussalam to achieve its national and international obligations."

The policy provides a useful foundation for both mandating emission disclosure, as well as for subsequent development of carbon pricing policies. Adjustments to the directive may be useful to clarify:

- a. whether reporting entities should use location-based accounting, market-based accounting, or a combination of the two;
- b. whether REC consumption claims can be used to reduce values of reported emissions, commonly permitted under market-based accounting and dual reporting structures; and
- c. where to find grid emission and residual emission factors needed to accurately calculate electricity-related emissions for reporting entities.

#### 3.1.3. Stakeholder Mapping

Domestic public sector actors have limited involvement in Brunei's REC ecosystem, with none of the previously described core REC market governance functions served in the national market. With respect to private sector actors engaged in the market, at the time of writing Brunei Shell Petroleum (BSP) was the only project registered in Brunei on the I-REC Evident registry. The associated RECs were self-consumed by BSP to demonstrate reductions in emissions associated with electricity consumption [36]. This indicates a very low level of both public and private sector engagement in the market, with private sector actors leading development.

Given the foregoing, Brunei's most pronounced near-term opportunities to expand and nationalise the market are first to educate national actors—both generators and potential industrial consumers of RECs— on how the market works, and also to nationalise issuance and governance functions by empowering a Local Issuer to take over market management.

These opportunities can be achieved by directly contacting the current market operator and requesting the appointment of a national authority as Local Issuer. In parallel, national actors should consider which entities are most appropriate to act as Local Issuer (as discussed in the following section) and work with the Standard and Central Issuer to insert them into the market.

Establishing a Local Issuer will enable national actors to oversee market implementation. Beyond this immediate step, regulatory functions governing REC market activity can also be introduced, though these should be considered only after national actors gain familiarity with the commercial aspects of the REC market. When selecting appropriate stakeholders in Brunei, there is no universal model for REC market oversight. However, the most effective structures typically involve collaboration between national authorities responsible for renewable energy oversight, utility providers, and regulatory bodies.

**Defining the roles of national entities is essential.** In Brunei Darussalam, this involves facilitating discussions between key stakeholders, including the regulator, *Autoriti Elektrik Negara Brunei Darussalam* (AENBD), and the Energy Transition Division of the Department of Energy, which leads clean energy programmes. Primary utilities such as the Department of Electricity Services (DES) and Berakas Power Company (BPC) should also be engaged.

Beyond energy sector actors, the participation of the Brunei Darussalam National Council on Climate Change (BNCCC) and the Brunei Climate Change Office (BCCO) will be crucial in REC market discussions. As BCCO oversees climate change policies and implementation, its involvement could help align REC market development with national climate objectives.

Dialogue between these entities should seek to identify which actors are best equipped to:

- a. designate a Local Issuer to oversee REC market implementation (often a regulator);
- b. act as the Local Issuer (often a utility, but only if the utility itself will not directly engage in REC sales); and
- c. eventually consider whether and how the local REC market should be regulated.

The key advantage to identifying a Local Issuer in Brunei Darussalam is that it would localise market governance, as well as support a domestic actor in receiving the revenues associated with issuance. The appointment of a Local Issuer at the national level can also facilitate knowledge transfer from international REC system operators to the domestic entity tasked with managing the market.

Since AENBD already functions as the electricity market regulator and the Energy Transition Division is responsible for initiating new renewable energy programmes, these two stakeholders are well positioned to determine the most suitable entity to serve as the Local Issuer. To ensure an effective selection process, it is advisable for the government to engage directly with the I-TRACK Standard Foundation—the sole REC standard currently issuing in the country—for guidance in identifying the best-fit Local Issuer [37].

The fundamental criteria for selecting a Local Issuer include choosing an entity that does not participate in REC trading but has extensive expertise in the electricity market. Strong affiliations with regulatory bodies are highly beneficial, as is direct access to electricity production data, which is crucial for verifying certificate issuance.

It is also important to note that national entities, such as AENBD or the Energy Transition Division, have the option to appoint themselves as the Local Issuer.

Beyond the public sector, Brunei's REC market will consist of independent power producers (IPPs), traders, and end users, including corporations and consumers. IPPs with operational assets in Brunei are the most likely early participants, as they stand to benefit the most from market development.

Traders, primarily based abroad, are expected to secure supply only after receiving clear purchase orders from entities with electricity demand in the country. Unlike neighbouring BIMP nations, where greater market liquidity and a broad buyer base encourage speculative trading,

Brunei's limited supply and demand suggest that early transactions will primarily involve self-consumption and occasional trades. These are likely to be concentrated at the end of the year and in Q1, when buyers seek to balance conventional fuel consumption with REC-based sustainability claims.

Unbundled transactions are expected to increase in frequency and scale as Brunei expands its renewable energy capacity and more multinational corporations seek to address Scope 2 emissions related to their electricity use.

## 3.1.4. Opportunities and Barriers to Consider in the National Market

Based on review of existing REC market conditions, key stakeholders, and policy documents, the most pronounced near-term opportunities for Brunei Darussalam are to:

**Review commercial documents to ensure they define attribute ownership.** Given the relatively small volume of transactions, and the fact that only one generation asset is registered in Brunei, this is an ideal time to start including environment attribute ownership clauses in new commercial documents, namely PPAs. This will help preserve clarity of ownership and sturdy issuance procedures as the market scales up.

**Identify and appoint a Local Issuer to manage the market.** The process should begin with engagement with the I-TRACK Standard Foundation to review best practices for selecting a Local Issuer. Following this, key national stakeholders in energy and climate policy should convene to determine their preferred approach to appointing an issuer. Relevant entities for these discussions include AENBD, the Department of Energy (including its Energy Transition Division), DES, BPC, BNCCC, and BCCS.

The appointment of a Local Issuer can be finalised in as little as one day, as it requires only a directive from a nationally recognised authority—most likely the Department of Energy—to instruct the existing REC system operator to onboard the selected entity. Following the appointment, the REC operator and its affiliates will facilitate training and handover procedures, typically taking one to two months, including technical onboarding and capacity-building sessions.

**Local Issuer to facilitate market growth.** Given the relatively small volume of transactions, stakeholder education and the provision of knowledge resources are essential. The need for market facilitation and education is reflected in the limited proportion of peak installed capacity registered in the REC system, despite anecdotal reports of unmet supply requests from market participants.

To support market growth, it is common for Local Issuers to collaborate with standards organisations, such as the I-REC Standard, to develop and distribute educational resources publicly. This approach requires no financial investment yet plays a crucial role in ensuring that private sector actors understand the REC market and can actively participate—an essential factor in driving market expansion.

**Review policy documents to ensure REC market considerations are included in national GHG management and reduction activities.** As emission reporting and carbon pricing instruments become more prominent in Brunei, their alignment with REC markets will become critical. Key areas to consider include how reporting entities will be required to calculate emissions associated with electricity consumption, whether RECs will be a permissible instrument to reduce said emissions, and how REC use will interact with national reporting on grid mix and residual mix emission factors.

## 3.2. Indonesia

## 3.2.1. Overview of National REC Market

The country has committed to achieving a 23% RE share by 2025 and has recently announced a net-zero target by 2060. These goals are part of Indonesia's NDCs under the Paris Agreement, which also commit to a 32% unconditional emission reduction target against BAU scenarios [38].

However, fossil-fuels still dominate the country's installed capacity, and despite noticeable renewable capacity additions since 2018, the share of renewables remained at only 16.9% of TPES in 2021.

The expansion of REC markets can significantly contribute to national decarbonisation efforts, particularly within the industrial sector. To achieve this, greater support is needed to help supply chains understand REC transactions and the process of reporting associated emission reductions to national authorities. Additionally, REC export opportunities—especially to high-demand hubs with limited supply, such as Singapore—can aid in meeting power sector NDC targets by leveraging international demand to drive domestic renewable energy capacity growth.

As of January 2024, Indonesia's REC market has exhibited rapid growth, expanding at an annual rate of 111% and reaching 4.68 TWh of transactions since its commercial launch in May 2022. The market features a diverse range of participants, including vendors, brokers, traders, and buyers, with the national utility playing a central role. Both I-RECs and TIGRs are actively traded, and the vertically integrated utility, PLN, has introduced a green tariff product denominated in TIGRs. As a key issuer and seller, particularly for bundled TIGR products, PLN has played a crucial role in market development. The presence of multiple REC instruments, high issuance and consumption volumes (as reflected in Tables 3.3 and 3.4), a strong base of active traders, and a variety of procurement options—including different fuel types, generator ages, and issuance vintages—are all positive indicators of a healthy and evolving REC market [39].

Currently, six renewable power plants are registered for REC issuance, with a combined capacity of 1.5 GW, capable of producing 4.5 TWh of electricity annually. In terms of REC commercial market potential, more remains to be done to encourage IPPs and asset owners to register production devices and request REC issuance. From a demand perspective, load-bearing entities beyond the corporate level (namely suppliers to multinational brands) can be encouraged to consume RECs in order to reduce Scope 2 emissions.

While the majority of Indonesian RECs are consumed against domestic load, the anticipated development of transmission infrastructure to deliver power into Singapore and other regional neighbours may create significant export opportunities for local IPPs.

Barriers and low-hanging fruit for market development are most notably concentrated at the policy and governance levels. For instance, ownership debates for environmental attributes between PLN and asset owners can be addressed in both policy and commercial documents to enhance global trust and confidence in the market. From a governance perspective, and similar to Brunei and other BIMP nations, the empowerment of a Local Issuer (for I-RECs) and a QRE (for TIGRs) could nationalise issuance functions (and associated revenue generation), while also solidifying forward movement for management of all national REC market activities.

Vintage		I-REC Issuance Volume per technology			
EC		Solar	Bioenergy	Hydroelectric	Geothermal
<u>±</u>	2022	53.713	38.519	887.340	397.278
	2023	11.526	13.061	235.205	243.061

Table 3-3: Indonesia's	Total Issuance	Volumes for	2022 & 2	023 Vintaae
	iotal issuance	volumes ior	2022 0 2	ozo viintuge

		TIGRs Issuance Volume per technology			
TIGRs	Vintage	Solar Serving On-site Load	Geothermal Energy	Hydroelectric Run-of-River	
	2022	6.005	1.584.225	748.440	
	2023	205	1.012.783	442.277	

Table 3-4 Indonesia's Total Redemption Volumes for 2022 & 2023

	Redemption	I-REC Redemptions per technology			
EC KEC	Date	Solar	Bioenergy	Hydroelectric	
-	2022	877.895	107.210	465.704	
	2023	744.251	110.094	3.760.965	

Note: To the knowledge of the authors, TIGRs redemption data is not publicly available.

#### 3.2.2. REC Market Potential and Regulatory Context

**REC market potential**. Indonesia boasts a wealth of diverse energy resources with significant renewable energy potential, particularly in hydropower and geothermal. According to the National Electricity Masterplan (RUKN) 2024, total power generation capacity is expected to reach 443 GW by 2060, with solar (109.4 GW), hydropower (70.5 GW), wind (73.2 GW), and geothermal (22.7 GW) serving as the primary drivers of growth. While the technical potential for solar and wind is considerable, their development has remained limited compared to hydropower and geothermal. However, the current installed capacity presents substantial opportunities to expand REC issuance volumes, which typically increase in response to rising demand [40].

Given its proximity to regional neighbours and planned grid interconnection points, Indonesia's REC market has considerable export potential, which can be augmented if reporting frameworks like RE100 begin to acknowledge specific types of cross-border transactions. In September 2023, Indonesia and Singapore signed an MoU on Low-Carbon Energy Development and Cross-Border Electric Power Interconnection, exploring potential interconnection routes with options under consideration for connecting Pulau Bulan or Batam in Indonesia to Jurong in Singapore. As such, Indonesian electricity exports (denominated in RECs) may be a viable opportunity for using regional corporate clean electricity demand to finance new installed capacity within Indonesia. Import opportunities for RECs into Indonesia are less significant, as there is sufficient land and renewable resources to construct new renewable generation, within the country, to meet domestic load. This may shift over time, particularly as local demand grows alongside CBAM implementation, but in the short- and medium-term, export potential is of higher relevance for the Indonesian context.

In terms of projected demand, Indonesia has both primary and secondary export goods economies. Secondary goods, such as footwear (2.7% of exports), electronic equipment (5.1%), and vehicles (3.7%) are all sectors that include a large number of corporate entities with RE100 commitments. This means that actors in the secondary goods area are likely to already be purchasing RECs in Indonesia. Associated demand will likely grow as buy-side understanding of how to transact RECs increases. The supply chains to these entities will also mature into an independent demand category, as is taking place globally.

Primary material exports are likely to play a major role in growth, particularly as CBAM implementation takes effect and is expanded to include categories relevant to Indonesia, such as metals.

In addition to Indonesia's fuel exports, which account for as much as 19% of exports, iron and steel account for 9% of exports, and copper another 1.3% [41]. Since CBAM will extend compliance mandates to primary goods, including metals, material exporters in Indonesia will begin to face levies when exporting into the EU.

Given that RECs are anticipated to be a permissible instrument for reducing emissions, from a CBAM disclosure perspective, demand is likely to surge as exporters are affected by new tax exposure.

As a result, it is likely that Indonesia REC demand will pivot to these critical export industries in line with compliance mandates, and atop existing demand for RECs in the voluntary market.

**Regulatory context**. The basis for the Indonesian renewable market is the National Energy Policy (NEP) of 2014, also known as Government Regulation No. 79 of 2014. This policy sets the broader agenda for energy development, including RE, and serves as the foundation for more specific planning documents.

One such document is the RUKN, which sets out the country's electricity supply and demand projections along with strategies to increase the share of renewable energy. The plan prioritises emission reductions by optimising energy supply through renewable sources such as solar, wind, hydro, and biomass. The state-owned utility, PLN, translates the RUKN into action through its 10-year Power Development Plan (RUPTL), which, according to available information, is scheduled for an update in 2025. In terms of renewable energy policy, Ministry Regulation No. 50 of 2017 provides the legal framework for RE development, enabling IPPs to generate and sell electricity to PLN.

In light of Indonesia's recent net-zero pledge for 2060, new regulations have been introduced to accelerate the transition to renewable energy. Notable among these is Ministry Regulation No. 26 of 2021, which promotes grid-connected solar rooftops, and Ministry Regulation No. 4 of 2020, which establishes benchmark electricity purchase prices for renewable sources. In May 2022, Indonesia released an updated draft of the Renewable Energy Bill, followed by Presidential Decree 112 of 2022 in September, aimed at expediting RE development. These measures strengthen support mechanisms for renewable energy, including updated feed-in tariff (FiT) guidance.

#### 3.2.3. REC-related Policy Development

**REC ownership**. Of primary concern in the Indonesian market are REC ownership rights associated with IPP-owned assets that sell electricity to PLN. Since legacy energy sector policy documents do not directly identify whether IPPs or the off-taker (PLN) own RECs associated with generation, there have been a number of ownership debates that have created negative press in the local REC market, and even led to a national pause in issuance in the I-REC market.

Disputes over REC ownership between PLN and IPPs have arisen due to ambiguities in legacy contracts, impacting market credibility and buyer confidence. Of critical importance to sound REC market development is the establishment of REC ownership rights in PPAs and FiT contracts.

Given that PLN owns (in part or in whole) several of the IPPs selling power back to PLN, REC ownership questions are not an issue where IPPs are both owned by, and sell power to, PLN. However, where IPPs are owned by independent third parties, many legacy contracts do not mention attribute ownership at all, which has led to considerable public debates on ownership.

The common practice, globally, is that IPPs retain the rights to RECs for generation assets they own, unless contracts clearly deliver ownership to the off-taker at the time of initial signature. The same is true of FiT contracts.

However, it is fairly common for FiT contracts to claim REC ownership on behalf of government or utilities from the start. While this is less common under standard IPP-utility PPAs, in Indonesia's case, legacy IPP contracts with PLN do not mention attribute ownership, and as a result, this should be the focus of policymakers in the short term.

The leading international practice on legacy contracts that do not mention attribute ownership outright is to allow the IPP, not the utility, to own the associated RECs. For new contracts that have not been signed, it would be entirely permissible for PLN to contractually claim ownership of these RECs, but the final verdict on this should be left to bilateral discussions between the IPPs and PLN. The key move is to ensure the FiT contracts define ownership clearly prior to signature, regardless of which entity is ultimately going to receive it.

**Recent development**. Indonesia does not have a unified REC policy. However, it is in the process of discussing a new law to oversee the development of RE, which may include provisions for RECs in Article 46. One of the key provisions of the draft law (in Article 44) is that businesses involved in electricity generation or holding licenses for self-use electricity from non-renewable sources must adhere to the New and Renewable Energy Portfolio Standards (RPS) [42].

This mechanism serves as an incentive for businesses to invest in RE sources, as they can offset their non-compliance by purchasing RECs, which represent electricity generated from renewable sources. Since ownership debates can reduce international trust in domestic REC markets, policymakers should prioritise establishing clear guidance on ownership through national energy policies and directly through collaboration with the I-REC and TIGRs market operators. Ministry of Energy and Mineral Resources (MEMR) may be well placed to host dialogues on this with the market operators and should consider doing so in the near-term.

## 3.2.4. Stakeholder Mapping

Utilities tend to either become commercially involved in REC markets (as is the case in Malaysia and Singapore), or serve in guidance and issuance roles, as is the case in Thailand. Both structures are fully aligned with international best practices, provided that no single entity concurrently performs both functions.

PLN, Indonesia's vertically integrated utility, has commercially positioned itself, with considerable success. In addition to unbundled products being sold by IPPs and brokers, PLN occupies a central role in Indonesia's REC market, complete with a bundled green tariff product.

The market has seen millions of REC transactions annually since its launch in May 2022, with rapid annual growth. REC sales reached 4.68 TWh in 2024, a significant increase from 2.76 TWh in 2023. Most REC purchases originated from the Java grid.

PLN's decision to act as a vendor, as opposed to serving as a Local Issuer, creates significant opportunities for PLN to sell RECs from projects within its portfolio, and to use the revenue to support new renewable generation.

Given its position as a vendor, PLN is not well-placed to act as a Local Issuer. However, its deep understanding of REC market needs creates parallel opportunities for PLN to coordinate with policymakers and regulators to identify an appropriate national entity to conduct issuance for both its own assets, and those owned by IPPs. Establishing local guidance on REC ownership—specifically for legacy IPP contracts with PLN that do not mention attribute ownership—will be critical for preserving trust and establishing forward market stability in Indonesia.

**Identification of roles for national entities**. Indonesia's REC ecosystem has developed primarily around commercial actors, though the state-owned utility PLN has played an important role in market growth.

Opportunities remain to enhance government oversight and engagement. The I-TRACK Standard and TIGRs registry both operate in Indonesia, and neither operator has reported being instructed by government to designate a Local Issuer/QRE to oversee market governance and implementation. Doing so is a low-hanging fruit opportunity to improve guidance and governance in Indonesia.

Additionally, this may serve to address some of the market barriers identified by stakeholders, such as lack of clarity on REC ownership structures between IPPs and the utility. Indonesia is developing a comprehensive legal framework for carbon economic value and RE integration, emphasising marketbased mechanisms like carbon pricing, RPS, and RECs.

MEMR and its associated Directorate General of Electricity (DGE) and the Directorate General of New Renewable Energy and Energy Conservation (DGNREEC) serve primary in oversight functions in the electricity and RE sectors. Together, these entities are responsible for policy formulation, monitoring, and supervision of electricity and RE projects.

As a result, MEMR may be well placed to serve as the national oversight body for REC market development, and potentially to delegate specific issuance roles to DGE, DGNREEC, or other divisions under MEMR.

At the same time, the Ministry of Environment and Forestry and the Coordinating Ministry for Maritime and Investment Affairs should be closely involved in REC market design and implementation considerations. The Ministry of Environment should be engaged in the market to review and confirm appropriate alignment between any inbound carbon programmes and the REC market, while the Coordinating Ministry for Maritime and Investment Affairs should be invited to provide inputs on both import and export considerations as they relate to grid infrastructure, RE investments, and (less directly) the retention of FDI sources that require REC tracking and associated products. Together, these entities can collaborate to address market design considerations to support credible implementation of ongoing REC market development.

## 3.2.5. Opportunities and Barriers to Consider in the National Market

In August 2022, PLN declared itself the owner of environmental attributes from IPP-generated electricity it purchased, contradicting international norms and lacking contractual basis. This led the I-TRACK Standard Foundation to temporarily pause I-REC issuance (between 15 August and 16 September 2022) for the affected IPPs, requesting clarification from national authorities on the legal basis for PLN's claim.

However, no response was received from Indonesian authorities, and the pause was lifted after a month. The I-TRACK Standard remains open to feedback from Indonesian authorities and may reinstate a pause if instructed by a relevant stakeholder.

The pause in issuance had limited financial impacts on market actors, considering that it was only in place for one month, and not during peak procurement season. It did, however, create far-reaching impacts on market credibility. Associations of IPPs and other market actors responded publicly to the PLN notice, and associated news articles indicated turbulence in ownership structures surrounding environmental attributes in the country.

While the incident was short-lived, it shook buy-side confidence in the market and may have had longterm impacts on instrument pricing and procurement structures. The issue can be addressed by releasing a notice or court opinion on the matter. The notice should be published independently (not by PLN or IPPs) to ensure that a policy or regulatory decision is independent of financially interested parties.

Based on a review of existing REC market conditions, key stakeholders, and policy documents, the most pronounced near-term opportunities for Indonesia are to address these issues:

**Identify and appoint a Local Issuer and QRE to manage the market**. This should begin by contacting the current market operators (the I-REC Standard Foundation and TIGRs) to discuss best practices for selection of an issuer/QRE. In a best-case scenario, this will be a single entity responsible for issuing both I-RECs and TIGRs, at the request of asset owners. To remain aligned with international leading practices in asset issuance, it is also important that the Indonesian entity not be PLN, given that it is commercially involved in the market.

MEMR is a likely candidate for identifying and appointing a Local Issuer/QRE, and could potentially fill this role itself. The appointment of this entity will facilitate the achievement of other near-term recommended steps.

**Define attribute ownership in legacy documents and new contracts**. Legacy contracts in Indonesia do not define attribute ownership. A single document, containing a table of different contract types and sale structures can be developed and circulated to the public to define which projects deliver attribute ownership to which entity type. This document should be developed in close consultation with:

- a. IPPs and representative associations;
- b. PLN;
- c. the current market operators (I-TRACK and TIGRs); and
- d. critically, a local court or ministry/regulatory representative.

Ownership designations should honour existing practices in attribute ownership in Indonesia, which will be absolutely critical for avoiding new ownership disputes that could further damage market credibility. Where policymakers wish to deliver ownership to PLN, it would be prudent to focus on new unsigned contracts, rather than retroactively assigning ownership under existing contracts.

Join the discussion on ASEAN regionalism to evaluate REC exports to Singapore. There are emerging opportunities to facilitate planned PPAs between Indonesia and Singapore concerning RECs. Accomplishing this will require that national actors engage in dialogue with the major international reporting frameworks, such as RE100 and SBTi, to ensure delivery of power and RECs under these PPAs are internationally recognised.

## 3.3. Malaysia

#### 3.3.1. Overview of National REC Market

Malaysia's national climate objectives align closely with its REC market activities. The country aims to achieve 70% RE share in its national installed capacity mix by 2050, with a current share of 26% in 2024, as part of its NDCs under the Paris Agreement. The Malaysia Renewable Energy Roadmap (MyRER) has outlined ambitious targets, including leveraging full hydro potential and large-scale solar development to meet these obligations, with the overarching aim of reaching 40% renewables by 2035 [43].

In August 2023, Malaysia released its National Energy Transition Roadmap (NETR), which further advances sustainable development objectives and establishes new potential use cases for RECs on Peninsular Malaysia, Sabah, and Sarawak . For instance, the RE pillar of NETR discusses the establishment of a pilot RE Zone, complete with low carbon industrial parks.

For these to be internationally credible, REC redemptions would play a significant part in achieving carbon reductions. Further, NETR establishes installed capacity targets for solar and other renewable resources, which can increase supply locally. Critically, NETR references the need to leverage certification systems for clean hydrogen—a likely export product for actors in Sarawak to capitalise on—which would in principle require REC redemptions to certify that electricity used to produce the hydrogen comes from renewable sources [44].

Malaysia is a significant player in the region's RE landscape and has one of the most effectively designed REC ecosystems in the region. The country has some of the highest issuance and consumption volumes in ASEAN, the widest range of possible bundled and unbundled procurement options, and a host of national and international vendors and buyers (indicated in Tables 35 and 36). The market also features a higher level of government oversight than regional neighbours.

	Vintage		I-REC Issuance Volume per technology				
EC		Solar	Bioenergy	Hydroelectric			
<u><u> </u></u>	2022	1.863.480	220.882	8.125.200			
	2023	157.496	59.966	954.538			

Table **3-5**: Malaysia's Total Issuance Volumes for 2022 & 2023 Vintage

		TIGRs Issuance Volume per technology				
TIGRs	Vintage	Solar (Photovoltaics)	Solar (Serving Onsite Load)	Biogas (Wastewater Methane)	Hydroelectric water (Dam/Impoundment)	
	2022	85.883	16.833	6.972	120.752	
	2023	25.293	6.292	0	162.329	

Table 3-6: Malaysia's Total Redemption Volumes for 2022 & 2023

Redemption		I-REC Redemptions per technology				
SEC SEC	Date	Solar	Bioenergy	Hydroelectric		
<u> </u>	2022	877.895	107.210	465.704		
	2023	744.251	110.094	3.760.965		

Malaysia's REC market has gone through several different stages of evolvement and is now approaching full market maturity—complete with REC market governance entities, clarification of contractual ownership in commercial contracts, and a forthcoming unified guidance document to cover (in the first instance) Peninsular Malaysia [45].

**Peninsular Malaysia**. Early-stage implementation was built on private sector registrations through both the I-REC and TIGRs systems. In 2019, the vertically integrated utility on Peninsular Malaysia,Tenaga Nasional Berhad (TNB) developed a green tariff rider programme known as myGreen+, which did not create much traction within the market as the demand for REC and green electricity was rather soft. Subsequently, TNB through its wholly-owned subsidiary, TNBX conducted split testing by offering both I-REC and TIGRs products to end users and ultimately settled on conducting issuance on the I-REC instrument. Thereafter, TNB managed to develop the utility REC program with the support from PETRA ministry and the Energy Commission, which now includes the white-labeled I-REC (branded as mREC) as well as an associated green tariff offering called the Green Electricity Tariff (GET) program.

**Sarawak**. Sarawak Energy has also enjoyed considerable success in monetising RECs associated with generation under its purview, it has been actively supporting business organisations across various sectors, including petrochemical, manufacturing and financial services, in attaining the REC to enhance their sustainability endeavours.

**Sabah**. Sabah has yet to develop its REC market at the utility-level. The region has an 80% RE target for its generation capacity mix by 2050. Associated RECs can be monetised—by developers of the utility, depending on contract structures—for consumption within Sabah, Peninsular Malaysia, and potentially through cross-border transactions, where physical PPAs exist with regional neighbours.

**Malaysia.** has managed to preserve a healthy balance between utility-run REC programs and private sector distribution channels. The current variety of market actors and distribution channels is an indicator of good market health and has results in a plethora of procurement options for end users—all denominated in globally recognised REC instruments. These include unbundled certificates, bundled REC from virtual PPAs under the Corporate Green Power Programme (CGPP), and the GET program. The range of stakeholders and procurement options means that buyers of different categories each have options to access REC and green electricity purchase options that meet their end-user needs, while the development of guidance materials will support long-term credibility of the market and support buy-side confidence when entering clean power contracts of all structures.

Given that Peninsular Malaysia, Sabah, and Sarawak have different energy sector regulatory structures in place, the federated entities should together consider whether REC market governance will be implemented uniformly across Malaysia, or whether governance and issuance functions will be disaggregated by subnational zones. Both structures have potential advantages and disadvantages that should be reviewed by policy and market actors in tandem.

#### 3.3.2. REC Market Potential and Regulatory Context

**REC market potential**. Malaysia's RE landscape is healthy, as of 2023, the total installed RE capacity stood at 9 GW, constituting 24% of the national energy mix which later grows to 26% in 2024. There is significant untapped potential in both solar and hydro, making the REC market in Malaysia a fertile ground for investment and development. In terms of asset registrations, under the national power sector regulatory framework, TNB has contractual ownership over large-scale solar (LSS) projects, as defined in PPA documentation, as well as for a range of large hydro projects in peninsular Malaysia.

There are considerable opportunities for TNB via its innovation subsidiary, TNBX to manage REC portfolios on behalf of any REIPPs that own RECs and are interested in designating them for onward sale to interested offtakers. REIPPs with institutional capacity in the REC space may also choose to handle the distribution of their RECs in-house or to contract with brokers or traders based on the best available rates provided by these different categories. Furthermore, as CGPP and the newly introduced corporate PPA known as Corporate Renewable Energy Supply Scheme (CRESS) activity scales up, the market is likely to witness an increase in the number of virtual and corporate PPAs (denominated in RECs) between REIPPs and electricity off-takers.

In terms of market potential, it will be critical for supply-side stakeholders to collaborate on increasing access to RECs, noting that the GET was fully subscribed within the first day of launch in 2023, and at the same time, corporate demand for Malaysian RECs often outpaces local demand

It is important to note that, in contrast to regional neighbours, where current buyers are primarily multinationals, buyers in Malaysia feature a healthy range of local and international companies, as well as a spread across brands and their supply chains. Since manufacturers working within a brand's supply chain tend to have a larger load than corporate entities, their presence in the Malaysian market has created a significant pool of local demand. Further, Malaysian procurement teams are among the most advanced in the region, largely due to the high volume of market training activities provided through conferences and public events in both Peninsular Malaysia and Sarawak.

The dual demand hubs from multinationals with loads in Malaysia and local industry players create significant growth drivers for the national market. Addressing local demand can support Malaysia in achieving sectoral decarbonisation targets, including for NDCs beyond the power sector. Meanwhile, export opportunities can help increase national installed capacity at the expense of regional neighbours—further supporting the achievement of power sector NDC targets.

In the future, Malaysia will also want to ensure available REC supply for its material exporters, particularly given a statement in the NETR that indicates, "It is estimated that 57% of Malaysia's total exports will be

affected by the implementation of CBAM." As a result, the current industrial consumer demand category is expected to grow considerably as exporters increasingly seek to power their operations with clean and RE sources.

**Regulatory context**. Historically, the Renewable Energy Act of 2011 and the Electricity Supply Act of 1990 have served as the basis for the Malaysian RE sector, including the REC market. These documents made little mention of environmental attributes, but provided sufficient baselines at the contractual level to allow for mutual agreement on attribute ownership through commercial documents—namely PPAs.

At the time of writing, the authors noted the government plan to publish the REC framework to improve market oversight in the country. This document will not be an official regulatory or policy document, but instead a non-regulated guidance document that can subsequently be adopted or referenced in wider energy sector governance materials, like the NETR to promote awareness. This follows best practices in the EU, whereby regional REC market actors have developed market guidance materials (as non-regulatory documents) which are later referenced or escalated into law under primary energy sector regulations.

The key opportunities to consider from a regulatory context, prior to escalating the document into a policy or regulatory space, are whether Peninsular Malaysia, Sabah, and Sarawak will follow the same guidance piece, and how to facilitate the engagement of Local Issuers and similar in market development.

Atop local demand, Malaysian REC export opportunities currently exist and are growing rapidly. These will need to be balanced with local demand. Policy makers should seek to provide dual opportunities for national actors to procure Malaysian RECs, while also leveraging demand from electricity buyers in Singapore to finance new domestic renewable generation.

As it stands, proximity and existing grid connections with Singapore establish Malaysia with promising REC export potential. This is the case because buyers in Singapore already have a significantly higher demand for RECs than what exists (or can physically be installed) locally. This has led to exceptionally high prices for Singapore-origin RECs, as well as an uptick in regional procurement discussions with a focus on moving electricity from Malaysia into Singapore.

As PPAs between Peninsular Malaysia and Singapore are signed and implemented, such that has been seen in the inaugural cross-border program known as the Energy Exchange Malaysia (ENEGEM), it will be critical that REC regulations allow for the movement of RECs alongside physical power, and at the same time, so that global reporting frameworks like the RE100 and SBTi recognise the associated cross-border transactions. Looking ahead, similar opportunities for exports are likely to emerge for Sarawak, with all matters related to energy policies in Sarawak fall under the purview of Ministry of Energy and Environmental Sustainability of Sarawak (MEESty). As Borneo interconnections increase, Malaysia's power and REC export opportunities are expected to continue expanding into Sabah.

## 3.3.3. Stakeholder Mapping

The Malaysian REC landscape is characterised by diverse stakeholders, reflecting a healthy market that

could benefit from the appointment of a national actor to provide uniform guidance.

The Ministry of Energy and Water Transformation (PETRA) sets overall energy policy, while the Energy Commission (Suruhanjaya Tenaga, or ST) regulates licensing and tariff-setting in Peninsular Malaysia. In 2023, Sabah fully autonomised its electricity sector with the establishment of the Energy Commission of Sabah (ECOS) under the Energy Commission of Sabah Enactment 2023, now responsible for regulating electricity supply and REC market implementation. In Sarawak, power sector governance has been successfully devolved, with the Ministry of Utilities overseeing regulatory functions. These government entities, along with other key stakeholders, play a role in developing the Malaysian REC Framework.

**Enhancement of national entities' roles.** Despite the maturity of Malaysia's REC market, several structural enhancements could further streamline and strengthen it. A key step would be appointing a Local Issuer for I-RECs, potentially the same entity serving as the QRE for TIGRs issuance. Empowering a national actor to oversee issuance across all REC systems would further integrate market structures, granting government actors comprehensive oversight while ensuring from a more efficient REC process and local support establishment. Inserting a single actor to oversee all REC issuance would also eliminate risks of double counting and further strengthen end-user confidence in the market.

As the national REC Framework is finalised and submitted for government approval, it is likely that a Local Issuer will be designated for these roles, unifying market guidance under a single entity. Currently, given its years of experience in the REC market, TNBX plays a central role in bridging government objectives with REC market operations, facilitating discussions with I-REC and incorporating buyer and seller perspectives into the national REC Framework. TNBX has also actively engaged representatives from Sabah and Sarawak in the National REC framework design and implementation, and should continue fostering alignment between Peninsular, Sabah, and Sarawak stakeholders to support REC market integration.

**Buyers and sellers.** On the sell side, Malaysia's REC market includes the standard mix of IPPs, brokers, and traders, supplemented by strong utility participation in both Sarawak and Peninsular Malaysia. Sarawak Energy Berhad was among the first Malaysian entities to explore REC markets, selling hydro-based RECs since 2019 via both the I-REC and TIGRs systems, offering buyers flexibility in delivery method. Sarawak Energy has also been actively involved in national-level REC market discussions, advocating for further development.

Sabah Electricity Sdn. Bhd. (SESB) is expected to become increasingly active in the REC market, with potential future export opportunities. TNBX is also likely to expand its REC activities across various instruments and delivery mechanisms. A critical step for market development remains the appointment of a single national authority to oversee REC transactions as a Local Issuer . This would facilitate the continued alignment of buyers and sellers across Peninsular Malaysia, Sarawak, and Sabah, reinforcing the growth and stability of the national REC ecosystem.

#### 3.3.4. Opportunities and Barriers to Consider in the National Market

Malaysia has three key opportunities to strengthen its REC market in the short term, while laying the foundation for future growth.

**Appoint an entity to oversee REC market development.** As previously noted, designating a national actor to serve as the Local Issuer for I-REC issuance and potentially as the QRE for Malaysian TIGRs is a feasible, high-impact measure that can be implemented immediately. This can be achieved by instructing market operators on the appropriate entity, or by incorporating a dedicated section in the Malaysian REC Framework to define the entity's identity, roles, and responsibilities to both the government and market participants. Establishing a national oversight body would allow issuance revenue to remain local, while enhancing the ability of national authorities to monitor, govern, and regulate the market effectively.

**Encourage transparency and product differentiation for nationally endorsed REC products.** Malaysia's REC market includes both standard transactions—such as unbundled products sold by brokers—and nationally recognised programmes like GET. Standard REC products should remain unchanged to ensure end-user confidence in fair governance and continued commercial flexibility. Meanwhile, Sarawak RECs, mRECs, and the GET programme can be adjusted, enhanced and improved to ensure their continued positioning as premium products in the international landscape. Potential enhancements include offering differentiation by fuel type (e.g., allowing consumers to pay a premium for solar over hydro) and introducing transparency measures that indicate whether and how revenues support the development of low-carbon technologies.

In the near future, the redemption of REC in a smaller temporal granularity (hourly) could serve the need for 24/7 REC in the market. These adjustments are commercial decisions which should ultimately be left to the preferences of their respective sellers—but the modifications may create opportunities to strengthen the Malaysian REC products and the wider market over time.

#### **3.4. The Philippines**

#### 3.4.1. Overview of National REC Market

As part of its commitment to the Paris Agreement, the Philippines is targeting a 35% share of RE in power generation by 2030, and 50% by 2040 [46]. However, data from 2022 indicates that RE sources only accounted for 22.1% (24,684 GWh) of the country's power generation, with coal remaining the dominant source at 59.6% (66,430 GWh). This highlights a significant gap between policy aspirations and current implementation. The REC market is viewed as a mechanism to accelerate progress toward these targets and contribute to the country's net-zero ambitions.

The Philippines houses both a regulated REC compliance market and an unregulated voluntary market at the time of writing. The compliance REC market in the Philippines formally commenced operations under the Philippine Renewable Energy Market (PREM) in August 2022 [47] [48]. As of March 2024, the eligible RE capacity under PREM stands at 3,128 MW, with the potential to generate 9.1 TWh of electricity annually, equivalent to 9.1 million RECs. Of this capacity, 43% (1,355.6 MW) operates under the FiT scheme.

Further details on REC issuance and redemption volumes are captured in Tables 3-7 and 3-8. The compliance market functions as the tracking system for national RPS, which is levied against mandated

participants. While the government does not directly oversee the voluntary market, operators in both the compliance and voluntary markets are collaborating to prevent the risk of double counting.

I-REC	Vintage	I-REC Issuance Volume per technology		
		Hydroelectric	Geothermal	
	2022	867.562	1.943.787	
	2023	93.028	160.738	
TIGRs	2022	0	22.000	
	2023	0	98.000	

Table 3-7: The Philippines' Total Issuance Volumes for 2022 & 2023 Vintage

Table 3-8: The Philippines' Total Redemption Volumes for 2022 & 2023

Veer	I-REC (E) Redemption Volumes			Estimated Revenue (USD)				
rear	Brunei	Indonesia	Malaysia	Philippines	Brunei	Indonesia	Malaysia	Philippines
2021	2	369.042	602.291	832.476	\$2.00	\$369k	\$602k	\$832k
2022	6.634	1.451.315	1.189.019	1.189.019	\$6.634	\$618k	<b>\$1.45</b> m	<b>\$1.19</b> m
2023	4.520	9.132.428	2.684.846	2.684.846	\$4.520	\$1.31m	<b>\$9.13</b> m	\$2.68m

The execution of the national system has faced considerable challenges that other countries should seek to avoid. Challenges surround inefficiencies between voluntary and compliance markets, a lengthy transition process which may restrict FDI into the Philippines, and highly prescriptive regulations that prohibit access of corporate power buyers to globally credible clean electricity procurement instruments. Primary inefficiencies surround the inability of buyers to access RECs in the voluntary market, due to restrictions imposed in the compliance market, and similarly overly strict regulations that prohibit eligible vendors (sometimes entities in the compliance market) from monetising excess RECs in their portfolios.

Given that RPS rules mandate that project categories—namely renewable generation commissioned after a 2009 cut-off date—issue RECs into the national compliance registry, RPS policies have indirectly led to issuance restrictions in the voluntary market. Unfortunately, compliance policies currently restrict access of corporate buyers in voluntary markets, creating inefficiencies and volume mismatches due to a lack of alignment between the two markets.

At present, participants in the voluntary market face restrictions in accessing RECs, even from generation assets they own, or from which they purchase power—a significant departure from leading practices in clean electricity procurement. This limitation stems from the ownership clauses in the national REC market regulations, which require that IPPs deliver RECs to distribution utilities (DUs), even in cases where corporate off-takers finance projects or purchase electricity.

A key premise at play in the Philippines market is that policy requires the use of a domestic registry that does not meet corporate sourcing requirements. In practice, this includes buyers directly investing in (or building) RE assets to make clean electricity claims. Current laws prohibit them from using registries and standards that would satisfy reporting needs for international disclosure systems like RE100, SBTi, and CDP Scorecards. Interviews with some of the largest multinationals operating in the Philippines have indicated this is a critical issue, both for investing in RE and, more broadly, for operating in the country.

The Philippines has the potential to lead as a strong REC market in Asia, provided it ensures that both voluntary buyers and obligated parties can obtain valid RECs. The country's REC market is in some ways advanced compared to regional counterparts, given that it features both voluntary and compliance structures, and a relatively high degree of national involvement.

The Philippines REC market offers valuable insights for neighbouring countries, both in terms of successes and challenges. Ongoing modifications in the market are expected to influence FDI in the RE industry and beyond.

## 3.4.2. REC Market Potential and Regulatory Context

**REC market potential**. Historically, fossil fuels have dominated the Philippines energy landscape, but the nation has made strides to integrate renewables. The Philippines has significant potential in RE sector, with a technical capacity that spans solar, wind, hydropower, and geothermal resources. As of March 2024, the Philippines had 3,128 MW of eligible renewable energy capacity, capable of generating 9.1 TWh of electricity annually, equivalent to 9.1 million RECs. Of this capacity, 43% (1,355.6 MW) is under the FiT scheme.

Solar yield potential ranges between 1,200–1,600 kWh/kWp, and the country has enough land to accommodate up to 7.9 thousand GW of solar capacity [49]. Southeast Asia has the second-highest wind resources, with a technical potential of 329.3 GW for onshore and 178 GW for offshore wind [50].

Additionally, untapped hydropower resources are estimated at 13.1 GW [51], and geothermal potential is around 4.4 GW [52]. A key area for policymakers to consider is how current and projected generation (potential REC supply) will be permitted to penetrate into the voluntary and compliance markets.

The Philippines' REC market is driven by both compliance and voluntary demand. The compliance market, guided by the Renewable Energy Act and other national policies, is designed to help meet the country's RE targets by imposing penalties on non-compliance to mandated participants. Compliance market demand will be directly proportional to targets imposed on obligated entities at the policy level.

At the same time, the Philippines hosts a range of multinational and national companies with demand for RECs used primarily to meet consumption and reporting commitments aligned with RE100, SBTi, and similar. Since the implementation of the compliance market, demand in the voluntary market outstrips the supply of RECs available for voluntary market actors to procure and redeem.

Given that the only projects currently eligible to issue voluntary market RECs are old generation assets (not mandated to issue into the compliance system), there are growing concerns from the corporate buyer community that access in the voluntary market is (or will become) limited to "low quality" RECs—those issued from older projects, with limited additionality narratives.

**Regulatory context**. The Electric Power Industry Reform Act (EPIRA) of 2001 laid the foundation for a competitive electricity market and ultimately led to the establishment of the Philippines' wholesale market. This move, in theory, opened the doors for competitive procurement of clean power from RE resources and was one of the first successful market liberalisations in ASEAN. However, current rules in the REC market prohibit potential buyers from benefiting from clean power procurement options made available through the wholesale market structure.

Building on market liberalisation, and among the most important legislation documents currently affecting the local REC market, is the Renewable Energy Act of 2008, also known as Republic Act No. 9513. This act was designed to accelerate the development and commercialisation of RE resources to reduce the country's dependence on fossil fuels. It established the RPS, with mandates on DUs and Electric Cooperatives (ECs) to source a portion of their energy from renewables. Subsequent policies have helped give shape to the RPS and PREM operations, including by imposing issuance requirements on different asset classes.

The period from 2017 to 2024 saw the release of several significant policies that affect RECs in the Philippines. The REM Rules were circulated for public comment in 2017, published as a draft in 2018, and officially released in 2020.

Policies affecting the RPS markets were published as Department Circulars and separated by on-grid and off-grid categories in 2017. The RPS rules establish the mandated entities, compliance targets and dates, and other rules concerning issuance and consumption to support tracking under the compliance market.

Key features of the REC market put forward in the REM Rules and the RPS rules include provisions requiring all renewable generation commissioned in or after 2009 to register in PREM (which indirectly prohibits its registration/issuance in voluntary markets), as well as provisions indicating the owners of RECs under different contract categories.

While these provisions are, in principle, supportive of establishing market clarity, their implementation as regulatory structures has made it difficult to make critical updates to support market health—such as permitting corporate clean energy buyers to own the environmental attributes and select where to conduct issuance.

The release of the Green Energy Option Programme (GEOP) Rules in 2018 created a surge of enthusiasm for potential corporate procurement options in the Philippines. In principle, GEOP establishes permissions for certain categories of end users (based on load profiles) to source renewable electricity through the wholesale market. However, conflicting ownership rules and current requirements to transact in the compliance registry have led to muted success.

The DOE website provides a list of approved RE Suppliers under GEOP, though in the absence of a credible delivery instrument for vendors to supply target buyers in the voluntary market, transaction options are limited by existing policies. DUs, IPPs, and large-scale end users have contacted voluntary market operators to request permission to conduct transactions under voluntary standards, to comply with RE100 and other reporting frameworks. Current bans on issuance (to avoid double counting) prevent

these transactions from going forward.

**Harmonisation of RPS rules with voluntary procurement goals**. Given that available REC supply in the compliance market is projected to be lower than obligations under the RPS by 2025, one possible trajectory is for all new generation to be forced to supply into the compliance system.

This would support the country in showing its ability to meet self-imposed compliance targets, but could threaten wider FDI in the nation if voluntary supply concessions are not built into existing policies. Considering RPS policies are commonly structured to encourage the construction of new generation capacity, supply mismatches (specifically under-supply in the compliance market) can be viewed as a healthy signal that RPS targets can support the construction and commercialisation of new generation.

Note that undersupply will only prove productive if corresponding commercial structures can be leveraged to increase installed capacity—price ceilings for compliance market RECs may mute potential gains if they are not managed carefully. In the US and EU markets, compliance systems often serve to establish price floors (as opposed to ceilings), which often increase the value of RECs in both the voluntary and compliance markets. Harmonisation of RPS rules with voluntary procurement goals can help establish similar complementarities.

Currently, the Philippines REC market is centred on domestic transactions. With the focus on establishing the compliance market and subsequently harmonising it with the voluntary market to meet demand, export opportunities are limited. If the national voluntary market demand remains unserved for an extended period, it is possible that end users in the Philippines will seek to import RECs from regional neighbours with less regulated markets.

REC imports could help address demand for credible instruments among voluntary buyers, without increasing prices in the compliance system. However, over the medium term, this would mean that new potential investments in RE in the Philippines could be diverted to neighbouring countries—creating more value for regional neighbours than national actors.

#### 3.4.3. Stakeholder Mapping

DOE serves as the national oversight body responsible for policy formulation and implementation. The Renewable Energy Management Bureau (REMB) under DOE focuses on the implementation of RE policies. The Energy Regulatory Commission (ERC) and the National Renewable Energy Board (NERB) are also involved in regulatory oversight.

The Independent Electricity Market Operator of the Philippines (IEMOP) performs the role of the renewable energy registrar (RER) for the compliance market registry, known as PREMS, and is currently responsible for registering and issuing PREM RECs in line with rules established in the REM Rules.

In parallel to PREM, the I-TRACK Standard Foundation and the TIGRs registry both exist in the Philippines. I-REC conducts issuance through the global issuer GCC, and is in conversations with domestic actors seeking national appointment of an entity to locally manage the voluntary market.

The Philippines government can appoint a Local Issuer at any time, which would move all voluntary

market issuance under the purview of the designated entity. Currently, I-REC has implemented issuance restrictions to avoid the risk of double counting in the Philippines, while still permitting issuance for no-risk assets—namely those which are not permitted to participate in the RPS or compliance registry [53].

TIGRs issuance of geothermal RECs has remained steady, though TIGRs issuance of solar RECs dropped to zero in 2022, and has not resumed activity at the time of writing [54]. With respect to oversight bodies, there is a clear and growing need for a national actor to be empowered to manage the voluntary and compliance markets, in parallel to improve market efficiency and rebuild end-user confidence in the market overall.

**Market actors**. Mandatory RE generators are larger entities like generation companies owning eligible RE facilities. They are mandated to participate in the REC market. Voluntary RE generators are smaller-scale entities generating RE for their own use or net metering, participating voluntarily in the REC market to sell excess RECs. DUs are responsible for electricity distribution, mandated to source part of their energy from renewables. Active in the compliance market, buying RECs to meet RPS obligations.

Retail Electricity Suppliers (RES) supply electricity directly to consumers and are subject to RPS obligations. They participate in both compliance and voluntary REC markets. Multinational corporations are major drivers of voluntary REC market demand, seeking to meet sustainability targets and comply with international reporting standards. Domestic companies are increasingly interested in RECs for sustainability commitments and to meet consumer/investor expectations.

## 3.4.4. Opportunities and Barriers to Consider in the National Market

The Philippines holds significant promise for establishing one of the most robust REC ecosystems in ASEAN. This potential is backed by the high level of consideration given to REC market design by national actors, and the comprehensive national policies that have been published to guide the market. There are tremendous opportunities for the country to leverage the REC market to help finance increase installed RE capacity, without the need for new subsidies and support mechanisms—namely by allowing end users to finance RE voluntarily. Note that this will require improvements to the existing REC ecosystem through harmonisation of compliance and voluntary market needs.

**Appoint a Local Issuer to manage the voluntary market.** The first step to harmonising voluntary and compliance markets in the Philippines will be to empower a national actor to oversee the voluntary market as a Local Issuer. Since the compliance market is currently managed by national actors, while voluntary market issuance is conducted by an overseas entity, communication gaps and limited coordination are to be expected. Empowering a national actor to manage the voluntary market can address this issue immediately.

The most likely candidate for managing the voluntary market will be the same entity tasked with implementing the compliance market (PREM). Placing all core implementation responsibilities under the purview of a single entity directly addresses issues of double counting, since all issuances would be conducted by a single organisation.

At the same time, empowering a single entity to oversee both markets will ensure that it can implement

regulations uniformly strengthening government control and oversight of all REC activity in a single move.

Adjust issuance requirements in the compliance market. Issuance criteria currently require that RE commissioned in or after 2009 register in the compliance system. The compliance system does not currently permit redemptions on behalf of non-mandated entities. Even if PREMS is functionality expanded to permit redemptions on behalf of voluntary market end users, it is not currently recognised by the major reporting frameworks. In effect, this means that all generation assets commissioned after 2009, including those eligible to sell power under GEOP, are barred from issuing RECs into a registry that meets global reporting requirements.

In principle, current registration requirements should support mandated participants in meeting their RPS obligations. Adjusting ownership structures and registration requirements under the RPS and REM Rules can immediately address this issue. Further consultations may be needed to support the review of these documents, ensuring that the same challenges do not recur.

**Support technology integration between registries.** The Philippines is conducting studies to understand and operationalise a voluntary market. This can potentially support long-term market development, but the associated timeline for developing a voluntary market is unclear.

At the same time, current inefficiencies threaten to redirect FDI out of the country. As such, though medium- and long-term studies and market adjustment may be beneficial, near-term opportunities should be considered to avoid widespread impacts of current issues—such as reputational harm and divestment.

One of these near-term opportunities is to establish technology bridges between the current compliance market registry and voluntary ones. This can be accomplished through defining API protocols between registries and agreeing on methods for cross-checking and exchanging information where appropriate and beneficial to both systems.

Doing so can immediately ensure that voluntary and compliance market demand can be met, while at the same time creating a new range of opportunities for policymakers to regulate and organise the market for optimal results. It is important to note that technology adjustments alone will not create robust solutions, and should therefore be aligned with potential adjustments to policies and other market guidance materials.

#### **3.5. Review of REC Proliferation**

In contrast to the multi-decadal development in the EU and North America, REC markets across ASEAN and BIMP have undergone rapid expansion. The region's increasing commitment to RE deployment, paired with an influx of corporate demand for renewables, has delivered triple-digit growth in both REC issuance and redemption, as reflected in Figure 3-1 [55].

Overall ASEAN REC market expansion has been driven by a combination of factors including:

- a. the onboarding of new national markets;
- b. increased demand from multinational corporations and their supply chains, with load in ASEAN (headquartered both in the region and outside); and
- c. the deployment of utility-led REC programmes alongside growth in the number of private vendors (brokers and traders).



Figure 3-1: I-REC(E) Volumes as Per Year of Issuance and Redemptio,

The onboarding of new national markets has significantly contributed to the rapid expansion of REC markets across ASEAN. Since the first I-REC(E) issuance in Vietnam in 2015, the region has seen substantial growth in REC adoption. By 2022, all ASEAN countries, except Myanmar, were approved for I-REC(E) issuance, while six also had access to the APX TIGRs registry—Brunei Darussalam, Cambodia, Lao PDR, and Myanmar being the exceptions.

In many markets, this expansion has been driven by national policies and regulatory frameworks that clarify and promote REC usage, providing a foundation for sustained market development. Notable examples include Singapore's SS673 and the PREM Rules, which have helped establish clear guidelines for REC transactions.

Simultaneously, the growing interest in cross-border clean electricity trade, particularly in markets with sophisticated buyers, has further accelerated the proliferation of REC markets. With buyers increasingly requiring the inclusion of RECs alongside clean power imports, demand signals from countries such as Singapore, Malaysia, and Thailand have encouraged the development of REC markets in neighbouring countries like Lao PDR and Cambodia. This integration has not only strengthened the regional REC landscape but also expanded transaction structures available to corporate buyers, facilitating greater market maturity and scalability.

For comparison, Europe's REC markets grew at an average annual rate of 15% between 2011 and 2021, and North America saw an 11% annual growth from 2010 to 2020 [56].

**Increased demand from corporations and their supply chains**. Large multinationals with ambitious sustainability commitments rely on high-quality REC instruments to meet the reporting requirements of frameworks like RE100 and SBTi. As global membership in these initiatives grows, and RE100's guidance has become widely recognised as a best practice, this has fuelled a surge in private sector demand for internationally recognised REC products across ASEAN and BIMP. The growing number and sophistication of buyers with electricity load in BIMP and ASEAN have increased the volumes, prices, and access to transaction structures for RECs available in the region.

Access to viable REC products can impact the movement of FDI into different global regions. If BIMP and ASEAN countries continue to provide access to globally recognised instruments, it will continue to drive an increase in the number of RE100 members with operations in the region. It is critical to note that corporate actors account for less electricity load than entities in their supply chains. As commitment frameworks such as SBTi increasingly require upstream decarbonisation, supply chains are anticipated to become the most significant contributors to clean electricity procurement in the region. Current growth factors in early adoption, while projected growth anticipates more robust supply chain procurement, as indicated by the growth of RE100 members in BIMP (Figure 3-2) [57].



Figure 3-2: Growth of RE100 members with operations in BIMP, 2022 - 2023

**Utility programmes and a growing range of access options**. In tandem with the demand from advanced multinational buyers, REC uptake among less sophisticated buyers, new to the market, has also steadily increased [58]. Utility programmes—alongside a growing number of brokers, traders, and marketplace environments—have emerged to support buyers with a range of purchasing preferences to access the market. Utility programmes simplify access to RE for a diverse range of end users.

As a result, the growth in utility green tariff programmes has contributed to overall growth in REC market transaction volumes, as well as to a wider user base of purchasing entities. The entrance of a wider range of brokers and traders, in parallel to the deployment of utility programmes, such as Indonesia's PLN

TIGRs-backed REC products, Peninsular Malaysia's GET, Thailand's Utility Green Tariff (UGT), indicates the health of wider regional REC markets by signalling that end users of varying capacities have access to a growing number of procurement options.

In parallel to the growth and success of utility green tariffs, the market has witnessed a near doubling in the number of brokers and traders engaged in REC market transactions, as evidenced by the growth in the number of trade accounts. The emergence of a wider range of traders, marketplaces, and advisory firms has helped educate end users and access a growing number of products.

#### 3.6. Economic Analysis of ASEAN REC Markets

**Price ranges**. REC prices across ASEAN vary significantly, influenced by factors such as supply and demand, technology types, and the REC vintage of available. Prices range from under \$1 to upwards of \$50 per REC, with values above \$10 currently viewed as fringe cases. While some price transparency exists in utility-driven programmes, market transactions handled by traders—representing a large portion of the market—often lack transparency, complicating the assessment of true REC market values across the region.

To further complicate price estimations, market operators (such as I-TRACK and APX) generally refrain from making any statements on price, as their inputs could distort market dynamics. There are, therefore, limited venues for market actors to use in determining "standard prices". Core sources that can be used include public pricing schedules, such as the TNB's GET rates 2025 (that comes with Imbalance Cost Pass Through (ICPT) mechanism waiver) is at RM 8 sen/kWh (for all domestic consumers and low-voltage nondomestic consumers) and RM 18 sen/kWh (for medium and high voltage non-domestic consumers) [59] , as well as subscription services from actors such as Argus and S&P, which publish REC prices for paying subscribers.

**Revenue generation**. Estimating the revenue generated by REC markets in ASEAN is challenging, due to limited price transparency. However, an average regional price of \$1/REC for the years 2021-2023 is assumed [60]. Based on this conservative average price assumption, we can calculate a baseline understanding of total revenue generated by REC markets in ASEAN and BIMP over the past three years.

It is important to note that "revenue generation" in the context of this report is used to signify the amount of revenue generated from the sale of RECs, which does not necessarily indicate the amount delivered to power producers. Revenue generation is the preferred figure, as it encompasses the amount of revenue generated through a REC transaction, including portions that may have been allocated to a broker, trader, or marketplace positioned between the original seller and buyer. Table 3-9 and Table 3-10 are redemption volumes and estimated revenue generation for 2021, 2022, and 2023 [61].

In aggregate, the ASEAN region has seen substantial growth in both REC redemptions and total revenue generated. Each BIMP country has contributed to this growth, with Malaysia leading in REC demand across ASEAN, followed by the Philippines as the fourth largest contributor and Indonesia at sixth.

Year -	I-REC (E) Red	emption Volumes	Estimated Revenue (USD)		
	ASEAN	BIMP	ASEAN	BIMP	
2021	3.827.575	1.803.811	\$3.83m	\$1.80m	
2022	9.279.958	3.264.802	<b>\$9.28</b> m	\$3.26m	
2023	25.524.959	13.135.830	\$25.52m	\$13.14m	

#### Table 3-9: Aggregate I-REC(E) Redemptions in ASEAN, based on Year of Redemption

#### Table 3-10: Aggregate I-REC(E) Redemptions in BIMP, based on Year of Redemption

Year	I-REC (E) Redemption Volumes				Estimated Revenue (USD)			
	Brunei	Indonesia	Malaysia	Philippines	Brunei	Indonesia	Malaysia	Philippines
2021	2	369.042	602.291	832.476	\$2.00	\$369k	\$602k	\$832k
2022	6.634	1.451.315	1.189.019	1.189.019	\$6.634	\$618k	\$1.45m	<b>\$1.19</b> m
2023	4.520	9.132.428	2.684.846	2.684.846	\$4.520	\$1.31m	<b>\$9.13</b> m	<b>\$2.68</b> m

**Drivers of future growth**. Several factors are expected to drive the continued expansion of ASEAN REC markets. As demand for RE increases globally, the region's markets are poised to benefit from both international trends and local market dynamics. These factors include greater understanding among stakeholders; increasing pressure on supply chains to decarbonise; and developments in compliance markets related to global trade and financial disclosure.

**Improved stakeholder understanding**. As national REC markets mature, key stakeholders—such as IPPs, end users, and governments—are becoming more adept at navigating these markets. This increased familiarity with REC mechanisms and their benefits is expected to lead to higher redemption volumes in the coming years. This has been seen in practice in the Malaysian market, where national and utility stakeholders have provided robust market education support for vendors and users of RECs. Emerging markets, such as Brunei Darussalam, Cambodia, and Lao PDR, may benefit from increased educational opportunities for clean power buyers and sellers.

**Increased demand from supply chains**. Global MRV frameworks like SBTi are increasingly encouraging companies to decarbonise their supply chains, particularly by addressing Scope 3 emissions. A recent report by CDP and Boston Consulting Group noted that corporate supply chain emissions are 26 times higher than operational emissions [62], creating significant pressure on businesses to address this gap. As a result, REC demand is projected to increase considerably as supply chain procurement targets are implemented by brands and MRV frameworks.

**Compliance market developments**. New compliance paradigms in Western markets, such as carbon border taxes and financial disclosure regulations, are anticipated to further stimulate REC demand. While voluntary markets currently dominate the ASEAN region, the establishment of compliance markets in economies like the US and EU will likely incentivise ASEAN exporters to procure RECs to meet evolving

regulatory requirements and avoid import penalties.

To capture the opportunities presented by these drivers, national actors should carefully consider their approach to REC market design. Engaging proactively with both voluntary and emerging compliance markets, while aligning domestic markets with national and regional regulations, will be crucial for ongoing success.

#### 4.1. Integrating RECs for Domestic and International Alignment

The effectiveness and credibility of a REC tracking system depend on how well it aligns with national and regional electricity market structures. There are two primary routes to achieving market alignment: (i) domestic legal alignment with the existing or planned energy sector and carbon accounting rules, and



# Aligning REC Instruments with Market and Policy Frameworks



(ii) international alignment through the appointment and subsequent actions of a national implementor (Local Issuer and/or QRE). Additionally, while not essential for basic alignment, developing a national REC framework can further deepen the interlinkages between tracking systems and electricity market structures.

**International alignment**. In addition to achieving domestic legal alignment, national actors should consider designating a nationally appointed entity to implement and oversee the domestic REC market. This implementing body, often referred to as a Local Issuer (I-TRACK) or QRE (TIGRs), plays an important role in aligning the global REC tracking system with both international standards and local legal and operational contexts.

To this end, the Issuer follows the requirements defined by the chosen REC tracking system's Standard, but can also introduce additional rules and procedures to ensure the system fits the specific national context. For instance, in countries that appoint Local Issuers, the entity will be required to follow all requirements of the Standard, such as those that surround minimum data capture requirements needed to verify that an asset has generated power.

In addition, the Local Issuer may deem that the domestic legal context provides for attribute ownership by a given entity under a specific contract class. In such cases, the Local Issuer will follow applicable rules and quality control requirements at the time of issuance, and may also make determinations as to which entities may request issuance, based on local regulations.

As the bridge between international best practices and local preferences, Issuers collaborate with market operators to align domestic market preferences with international standards. Typically selected by government ministries or representatives, they represent the country's rules on both regional and global platforms.

Issuers should be independent of market participation, align with national objectives, and have the capability to process data and engage in contracts to be effective. Common choices for Issuers include ministries of energy, energy sector regulators, or non-profit organisations, provided they remain independent from REC trading activities.

Having a single entity oversee multiple national REC systems can create operational efficiencies and prevent double counting, particularly in countries with access to more than one tracking system and registry.

**Domestic legal alignment**. Domestic legal alignment ensures that REC tracking systems comply with national laws and regulations governing the energy sector and carbon accounting, facilitating their successful integration into national electricity markets.

National actors should review existing electricity market rules and product options to understand current contract structure provisions for attribute ownership to achieve alignment. Conducting a mapping exercise to understand what domestic contracts and PPAs deliver attribute ownership to which actors can help clarify how the REC tracking system fits into the broader national context, identifying areas of

compatibility or incompatibility with existing RE ownership and transaction contracts.

This understanding enables national actors to ensure that REC systems adhere to national energy policies, carbon accounting rules, and market regulations. It also allows for a clear definition of attribute ownership in contracts, ensuring that REC-related agreements are legally sound and enforceable.

**Avoidance of double counting**. It is crucial for actors that manage standards and registries to distinguish between RECs and carbon credit ecosystems, and to set in place guidance on how double counting will be avoided between systems.

This can be achieved within the REC standard and the carbon standard, by ensuring that each guidance document requires that a unique MWh of power be registered only in a REC or a carbon credit system, **but not both**. Contractual rules and agreements established by the tracking system providers are essential to prevent double counting, while additional technological solutions, such as API agreements between REC and carbon registries, can provide an extra layer of security. Technological measures can enable issuers to cross-verify project details, such as GPS coordinates, in each other's databases, thus maintaining the integrity of both REC and carbon credit systems, and the accurate accounting of environmental benefits.

As a general guidance note on the avoidance of double counting, the bare minimum is that the given REC standard set rules on asset registration and issuance that require project registrants to contractually guarantee that they will not request issuance of more than one environmental attribute for a given unit of power generation.

The introduction of API integration between registries can be implemented as an added layer of protection, to be used largely by issuers in the validation process, but is not a requirement for avoiding double counting. Domestic alignment to avoid double counting may take place between multiple REC registries, carbon credit registries, and combinations of the above, responding to the design of the local REC and carbon credit ecosystems—to be evaluated on a case-by-case basis.

**Framework for alignment**. The final aspect to consider, that can enhance the alignment of a REC tracking system with national or regional electricity market structures, is the development of a national REC framework, as seen recently in countries like Singapore and the Philippines, and in the near future Malaysia. Frameworks are non-regulatory documents that are written to provide local context to a nationally operated REC tracking system. Countries often select private operators or hybrid models, adhering to the rules of international operators to ensure domestically issued RECs meet international MRV requirements. The development of national REC frameworks, which operate on top of international systems, enables nations to add country-specific rules to govern underlying international systems— aligning global credibility with domestic implementation needs.

A national REC framework typically outlines global best practices that the country wishes to implement locally. It provides an overview of these practices and details how they integrate with local conditions, giving market participants clear guidelines on how the national market operates and the principles behind its operation. By layering additional rules on top of underlying international standards and registry procedures, frameworks address specific local needs and conditions, so that the REC system is tailored to the national context while remaining globally compliant.

#### 4.2. Aligning Carbon Markets, RECs, and NDCs

As national and international carbon credit programmes evolve, the potential for double counting against REC systems increases. If systems permit carbon credits for renewable energy projects, it is critical that both REC and carbon credit standards clarify that each unique MWh qualifies for either a REC or a carbon credit, but not both. Although awarding carbon credits to renewable projects is becoming increasingly uncommon, any new schemes in BIMP countries that do so must establish clear rules to avoid double counting. While contractual rules and agreements can help prevent this issue, buyers often prefer technological solutions, such as Non-Disclosure Agreements (NDAs) and API agreements between REC and carbon registries, which enable issuers to cross-verify project details—such as GPS coordinates—in each other's databases.

The primary focus should be on preventing double counting between systems. To achieve this, REC and carbon documentation must identify potential risks—such as environments in which both carbon credits and RECs may be issued for the same renewable power production—and clearly outline rules and protocols to ensure that no individual MWh receives more than one instrument. At a minimum, these measures should be contractually enforced; however, a more robust approach can be implemented through API interconnections between relevant registries. Regular communication between responsible parties regarding the execution and verification of contractual and API checks can further prevent double counting and harness synergies between REC and carbon markets.

Carbon pricing policies can further define whether RECs contribute to reducing an entity's reported emissions. For instance, an entity subject to emissions thresholds under an emissions trading system (ETS) or carbon pricing policy might aim to reduce its Scope 2 emissions through the procurement of clean electricity—either via bundled or unbundled REC procurement. It is essential that such policies specify the acceptable decarbonisation pathways, clarifying whether REC procurement is an allowable strategy and identifying any specific transactional requirements (for example, whether bundled or unbundled RECs are necessary) or REC features required for acceptance.

**Aligning carbon pricing policies with REC markets**. REC instruments can be integrated into carbon pricing policies to enhance efficiency and address double-counting risks. While global alignment procedures are still in their infancy, emerging structures within ASEAN provide the building blocks on which to establish more robust alignment protocols between carbon and REC markets.

As the only member nation with a carbon pricing mechanism, Singapore sets a unique example in ASEAN environmental policy. Singapore's NEA, in collaboration with the National Climate Change Secretariat (NCCS), oversees and implements the Carbon Pricing Act of 2018.

While NEA oversees Singapore's carbon market, it has relatively little involvement in the REC market. Despite its progressive approach to emission pricing, more can be done to integrate Singapore's carbon pricing mechanisms with the REC market. A key area to address in doing so is the overlay between the primary national REC document (Singapore Standard on RECs [SS673]) and the Carbon Pricing Act [63]

[64].

SS673 sets a positive example by addressing double counting, but stops short of linking directly to national carbon policies, limiting its effectiveness as a blueprint for ASEAN countries aiming to align carbon policies with REC systems.

Conversely, to the knowledge of the authors, the Carbon Pricing Act does not directly indicate whether RECs can be used to decarbonise operations and (inferentially) be used to meet emission requirements or to avoid penalties. This indicates opportunities to enhance efficiency between carbon and REC markets—for instance, by providing direct cross-references between the Carbon Pricing Act and SS673. Other actors in ASEAN may wish to consider integrating REC market considerations into carbon policies, and vice versa, if similar carbon policies are rolled out in the future.

**Relationships between RECs and NDCs**. This section reflects the opinions of the authors and should not be construed as policy, market, or legal advice. Owing to the dynamic nature of NDC accounting systems, the absence of official rules or guidance from relevant stakeholders, and insufficient data to offer definitive recommendations, the following content is provided for educational purposes only.

RECs create financial incentives to boost renewable electricity generation and often help reduce public sector subsidy costs. Although they track renewable production and consumption, along with the associated environmental attributes, RECs are not designed as carbon accounting instruments. Instead, they uniformly document the generation of 1 MWh of renewable electricity and allow for the transfer of the corresponding environmental attributes to the designated end user.

In contrast, NDC targets in the power sector focus on production capacity rather than on volumetric production or consumption. For example, a power sector NDC target might aim to install 500 MW of renewable generation capacity by 2030 rather than setting a target for consuming 20,000 MWh of renewable power annually from that date. Corporate reporting frameworks, such as RE100 and SBTi, concentrate on the actual consumption of individual entities. This distinction in accounting approaches helps to reduce potential overlaps between NDC and corporate consumption claims, particularly regarding power sector targets. Although the United Nations Framework Convention on Climate Change (UNFCCC) has not issued direct guidance on the use of RECs within NDC accounting, the authors are of the opinion that there is no direct conflict or overlap between power sector NDC targets and REC accounting systems.

Beyond the power sector, broader NDC emission reduction targets may benefit from REC market transactions. For instance, if a national NDC accounting system recognises REC redemptions as a valid decarbonisation pathway for industrial sectors or for achieving absolute emission reductions, then redemptions by relevant actors could theoretically be counted against the national inventory. While the authors believe that the underlying logic of both NDC and REC market accounting structures should accommodate such transactions, global credibility would require that the UNFCCC and voluntary market reporting frameworks review and potentially endorse this approach. Discussions between the relevant parties are ongoing, though public guidance has yet to be issued.

From the perspective of REC registries and standards, a cross-border transaction occurs when power is

produced in one country, a REC is issued for that generation (indicating the country of origin), and the REC is subsequently redeemed against load in a different country. This process is already taking place within the ASEAN region. However, for cross-border REC transactions to realise their full financial potential and to meet the requirements of buyers reporting to international frameworks, it is also necessary for these frameworks to recognise or endorse such transactions. Currently, framework endorsement on cross-border transactions—at least under RE100 Technical Criteria—is limited to transactions within the EU and select areas in North America.

As physical cross-border electricity transactions among BIMP and ASEAN nations scale up, framework endorsement will play a key role in supporting the financial viability of generation projects and cross-border transmission infrastructure. At the time of writing, RE100 has recently released a document indicating conditions it views as necessary for endorsing cross-border transactions in new regions [65].

The EU leads globally in implementing and recognising cross-border REC transactions, offering replicable practices that can be tailored to regional circumstances in BIMP. While transaction structures, framework approvals, and market behaviour in ASEAN will differ from the EU, there are valuable lessons to be taken from the EU context for onward adjustment and implementation in BIMP and the wider ASEAN region.

In the EU, the concept of a 'single market' for renewable electricity is central to its REC framework, known as the European Energy Certificate System. International disclosure frameworks recognise this market, extending beyond geographical boundaries as a result of regulatory framework integration and physical grid interconnectivity [66].

The EU-28, along with the European Economic Area (EEA) countries (except Iceland), and certain microstates due to their special relationships with the EU, collectively form this single market. The EU's political and economic union enables seamless REC transactions across these nations, thanks to regulatory standardisation which requires membership in the Association of Issuing Bodies, use of the European Energy Certificate System (EECS) rules (and future additional regional standards), and mutual recognition of market-based REC instruments (Guarantee of Origin).

RE100 has indicated that other global regions are unlikely to form identical "single markets" in the absence of standardised energy sector regulation; however, there are options for recognising specific bilateral transactions where physical electricity flows between countries.

## 4.2.1. Reporting Frameworks Acceptance of BIMP/ASEAN's Cross-border REC

As cross-border electricity trade expands, particularly within the BIMP and the broader ASEAN context, a robust framework for tracking the physical flow of electricity, harmonising environmental attribute certification, and aligning emission calculations is essential. The following sections delve into three key criteria that are crucial for enabling seamless and trustworthy cross-border RE trade within the BIMP-EAGA region and beyond.

**Tracking physical electrons**. It is essential to verify and trace the physical flow of electricity from renewable sources across borders. Different data-sharing structures may be necessary under point-to-grid versus grid-to-grid interconnections. Countries should collaborate to build infrastructure and establish
uniform protocols for monitoring and verifying the actual movement of electricity, and for collecting associated data for onward use by entities with permission to access it. This ensures that physical energy flows back any RE consumption claims, which is a stated requirement under the RE100 guidance. To achieve this, structures for data sharing should be put in place to evidence specific volumes of generation from renewables, and transfer of electrons between grids equal to or in excess of renewable production for the devices in question.

**Uniform EAC system**. Countries on both sides of the border should adopt the same EAC system for settlements. In the EU, the use of Guarantee of Origins (GOs) exemplifies this. For BIMP-EAGA, both I-REC and TIGRs are available and internationally recognised by the major reporting frameworks. Uniformity in the EAC system ensures consistent accounting and recognition of the environmental attributes of generated electricity. Instruments may need to be recognised as legally enforceable transaction instruments on both sides of the border, to ensure transactions are fully recognised by public and private sector actors.

**Consistent grid mix and emission factor calculations**. It is critical to consistently calculate grid mix, residual mix, and associated emission factors between national borders engaged in cross-border RE and power trade. This consistency allows for accurate assessment and reporting of the environmental impact of cross-border electricity transactions and, where necessary, consistent reporting between countries and companies on both sides of the market boundary. To achieve this, there should be agreement on how both sides of the border treat cross-border electricity movement, to ensure transparency and accuracy.

Using consistent methodologies for calculation, ensuring the same timelines for disclosure, and reaching a bilateral agreement on how imports will be treated are important first steps for bilateral alignment on emission reporting and residual mix calculations.

## 4.2.2. I-TRACK's Regional Working Group for Southeast Asia

In March 2022, RE100 conducted an open consultation to discuss a proposal allowing cross-market procurement under conditions which included physical transmission, enforceable contracts, and residual mix calculations [67]. This proposal aimed to facilitate renewable electricity sourcing across market boundaries. However, RE100 withdrew the proposal in October 2022, due to concerns that open-scope recognition might confuse and hinder RE contract and project development [68].

Instead, RE100 stated that, although they could not prescribe detailed mechanisms, three conditions are necessary for recognising physical cross-market procurement:

- a. physical cross-border transmission;
- b. consistent accounting of energy attributes in both origin and destination markets; and
- c. mutually recognised instruments and contracts.

These were formalised in the previously referenced conditions document and currently serve as the basis for activities seeking to facilitate framework endorsement of specific transactions in the ASEAN region.

Responding to increasing requests from private and public sector stakeholders, the I-TRACK Standard

Foundation has established a Regional Working Group. This group aims to pave the way for cross-border RE trade recognition by ambition frameworks like RE100. The group will collect insights from government and private sector representatives to define national REC border policies, communicate these preferences directly to international frameworks, and provide guidelines for countries to gain approval for specific cross-border transactions, such as PPAs. The goal is to develop MOUs between governments that outline national REC border preferences and align cross-border transactions with international best practices.

These best practices include tracking of electrons, environmental attribute settlement using RECs, and uniformity in emission data calculations. The culmination of the working groups will be the provision, from the Foundation to national actors, of template MOUs that can be circulated directly to reporting frameworks. The MOUs will be designed to identify best practice conditions being met in individual nations, and bilaterally for optional signatures by national actors and onward circulation to framework representatives.

Achieving these goals would increase the likelihood of major reporting frameworks recognising certain types of cross-border transactions, namely bundled PPAs. This recognition could lead to more cross-border electricity trade and a boost in renewable capacity across ASEAN.

## 4.3. Policy, MRV, and Legal Frameworks for Robust REC Markets

As REC markets expand and mature, it is common for policymakers to inquire about how to fully nationalise or regulate domestic markets. While the nationalisation of REC ecosystems and associated regulations may offer short-term gains in terms of strengthening market oversight, they may risk limiting market flexibility and opportunities for regional collaboration.

Further, introducing purely domestic REC standards and registries may fail to address the needs of buyers such as the alignment of REC ecosystems with reporting frameworks and inbound global compliance systems. To this end, policymakers should carefully consider available approaches that can help leverage existing resources (e.g. existing international standards), while also ensuring adequate control over the domestic ecosystem.

Aligning national REC markets with international standards and encouraging regional cooperation has proven to be an effective strategy for long-term success. By integrating with regional initiatives in a controlled and stepwise manner, national markets can remain flexible, innovative, and well-positioned to respond to global trends.

This is particularly important as international economic compliance mechanisms, like CBAM, begin to roll out guidance and rules that will influence global trade. A strictly nationalised approach may isolate markets, hindering their ability to participate in a robust and interconnected regional REC framework.

A balanced approach involves developing frameworks that guide market development, while promoting regional integration and cooperation. This ensures that REC markets can thrive domestically, while remaining competitive and adaptable within the broader global context.

## 4.3.1. Policy Considerations from EU Regional Cooperation

The EU offers a valuable model for BIMP/ASEAN national actors, demonstrating how a regionally integrated REC market can operate while preserving national autonomy. Instead of nationalising REC markets, the EU employs a three-layered structure, combining flexible market guidance, enforceable standards, and strategic policy regulation, giving national authorities the ability to implement specific domestic rules where needed [69].

As illustrated by Figure 4-1, at the heart of the EU system is the GO, the regional EAC defined under the EECS Rules. These rules, managed by the Intergovernmental Association of Issuing Bodies (AIB) [70], provide voluntary market guidance on the issuance, transaction, and use of GOs. Crucially, the EECS Rules are not tied to direct policy, offering flexibility to adapt transactional rules without requiring direct involvement from policymakers. This flexibility has allowed the EU to experiment with new energy carriers and market mechanisms, without causing major market disruptions.



Figure 4-1: Structure of EU's REC Market Regulation and Guidance

Note that the EU ensures uniformity through its regulatory framework. Under the regional Renewable Energy Directive II (RED II) policy [71], each member state must provide for an EAC tracking system that meets quality standards outlined in the CEN 16325 Standard [72].

Furthermore, all RE claims in the region must be made using GOs, ensuring consistency across borders, and facilitating cross-border trade under a single market recognised by international reporting and disclosure frameworks.

This combination of mandatory GO usage for disclosure and flexible implementation by national actors ensures that the EU maintains a competitive, regionally integrated REC market, without over-regulating how RECs are created or used.

When considering the EU model for replicable features relevant to ASEAN, several key distinctions should be considered. The EU enjoys shared energy sector regulation (RED II), which is not the case in ASEAN. This means that guidance affecting RE disclosure across nations in the EU is regulatory, while the same may not be appropriate in the ASEAN context. To this end, it is advisable for the AMS to consider developing non-regulatory materials together that would guide (on a non-regulatory basis) the use of RECs prevalent in the region. Examples of such guidance documents exist in both Malaysia and Singapore, each of which has developed REC market documents that indicate how domestic stakeholders can engage in REC market interactions.

On this point, it is also important to consider that in the EU context, member states are bound by shared regulation. In the ASEAN context, it is likely that guidance materials would need to be written such that they identify first the primacy and autonomy of actors in each country, indicating that participation in wider regional guidance frameworks is optional, based on the preferences of international actors.

Policymakers should focus on creating frameworks that guide REC market development, rather than redesigning instruments or directly regulating their use. Approaches for using existing standards to guide market growth under the close control of national actors are recommended. The EU model demonstrates the value of regional cooperation, where flexible guidance is combined with enforceable regulations, allowing for broad market participation while enabling future adjustments to meet evolving regulatory ambitions.

As APG conversations and physical infrastructure mature, it will become increasingly important for national actors to consider how REC tracking systems can be expanded to foster the preferences of national and regional actors, while remaining reticent of the needs of electricity buyers. This can be accomplished in the BIMP and ASEAN region by:

- a. ensuring that existing systems meet the needs of individual nations, through the development of national REC guidance documents;
- b. supporting government actors to appoint focal points, such as Local Issuers, that can oversee domestic rollout of globally credible instruments; and
- c. encouraging focal points in each country to meet regularly and design shared guidance documents to oversee further rollout of REC ecosystems in the region.

## 4.3.2. MRV Structures

The design of REC systems should meet the needs of the end-users for which the system is designed. End users generally fall into the categories of international buyers with domestic load (responding to global framework requirements), and nationally obligated entities (responding to compliance regulation). Wherever practicable, REC ecosystems should be designed to address the needs of both end-user categories. In cases where this is not possible or is not preferred by national actors, policy materials should identify how different systems coexist, and how the needs of different end-user categories can be met. Doing so is essential for retaining FDI and attracting investment.

For national REC markets to be considered credible and facilitate adoption by global buyers, they should align with international MRV systems. International MRV systems, such as the GHGP, RE100, and the SBTi, provide a globally consistent approach to carbon accounting and RE reporting. Aligning national REC

systems with these frameworks is essential not only for voluntary market participation, but also for future compliance markets such as the EU's CBAM, which will demand higher levels of accountability.

At the same time, it is equally important for domestic REC systems to meet any country-specific requirements that may be imposed by domestic energy sector regulations. In national compliance markets, such as the Philippines' RPS, perhaps the most important feature of the domestic REC standard is that it complies with all requirements set at the regulatory level. Again, however, it is important to note that compliance of a domestic system with national regulations does not guarantee compliance with, nor recognition by international MRV frameworks. To facilitate the sustained use of REC systems operating in compliance contexts, it is critical for policymakers to develop pathways that deliver access to instruments that meet the needs of diverse actors—such as both obligated entities and voluntary users.

Policymakers must prioritise aligning national REC systems with international MRV frameworks (intersection between RECs Tracking and MRV Reporting elaborated in subchapter 2.1), to ensure market credibility, attract global participants, and support growth. Failure to meet global MRV requirements risks sidelining national markets, limiting their ability to integrate into the global economy. By adopting internationally recognised standards like the I-REC(E) Code or TIGRs, national systems can meet global expectations, facilitating smoother integration into both voluntary and compliance markets.

## 4.3.3. Legal Considerations

In addition to policy and guidance considerations, national authorities should prioritise establishing a robust legal framework to support REC market growth. The foundation of this is to clearly define ownership rights for environmental attributes and to ensure that these ownership rights are clearly defined in commercial agreements that govern energy sector transactions (e.g. PPAs). Without clearly defined environmental ownership rights in PPAs and other commercial documents used in the energy sector, the REC market's efficiency and credibility can be compromised, undermining confidence and use by market participants.

Defining ownership should consider two core types of governance materials: primary and secondary. Primary governance materials are foundational documents that directly govern the creation, transaction, and use of RECs. These include global operational standards, like the I-REC(E) Code, which is already in use in the majority of ASEAN markets, and national or regional frameworks that adapt global standards to local contexts. These primary documents are essential for establishing the fundamental rules that ensure the market operates smoothly.

Primary documents used in the REC market are most often not policy, regulatory, or legal documents. Rather, they are guidance materials used to organise the market. They will define rules for who is allowed to engage in REC markets in what ways, and will also make provisions for how issuers are to review or consider attribute rights defined in commercial agreements. Provided that individual countries use existing standards, the ownership principles established therein are adequate to ensure continued sound operation of the market, while avoiding risks of double counting.

However, the effectiveness of these primary materials with respect to establishing legal ownership

of environmental attributes is contingent on how they interact with domestic secondary governance materials used in the energy sector. Secondary materials are generally commercial or policy documents that reference ownership of RECs or environmental attributes within a wider commercial or policy context. Examples include PPA contracts and energy sector policies, which may need to be updated to include REC ownership rights and transactional clauses in cases where they are not currently mentioned.

The success of a REC market hinges on the alignment of these secondary documents with primary standards, ensuring that the rules governing REC transactions are reflected in the broader legal and commercial frameworks that support market operations.

A primary REC document, such as the I-REC(E) Code, specifies that Local Issuers implementing the standard domestically must review power purchase agreements (PPAs) to determine which party—typically the independent power producer (IPP) or the power off-taker—has the legal right to register assets and request REC issuance. Local Issuers must then refer to domestic PPAs (secondary documents) to verify whether contractual rights to request issuance are explicitly defined.

In the BIMP and ASEAN regions, primary REC documents are generally sufficient to address the initial determination of ownership rights. More recent PPAs and utility offtake agreements typically specify whether the generator or off-taker holds attribute rights. However, older contracts often lack clear provisions on attribute ownership. These legacy agreements may require targeted legal review on a country-by-country basis to clarify ownership. Legal experts should collaborate with IPPs, off-takers, and existing standards before making determinations to ensure that any modifications to legacy contracts align with best practices and the expectations of commercial stakeholders.

Clearly defined ownership rights are essential for building trust among market participants—producers, traders, and consumers—by ensuring that all parties understand how contractual obligations in the energy sector impact REC market access. To achieve this, contracts should explicitly state who owns the RECs or environmental attributes at each stage of the transaction and the conditions under which ownership is transferred.

Additionally, legal and policy frameworks should support market transactions, enabling IPPs and consumers to engage in REC trading in a way that aligns with their financial and operational objectives. While policymakers should encourage contracts to clearly define ownership, they should avoid mandating which party assumes ownership. Allowing flexibility in contract terms enables the private sector to efficiently develop new commercial agreements for renewable energy transactions between willing buyers and sellers.

# Chapter 5 Building Blocks of Regional REC Framework



## 5.1. REC Market Governance and Implementation

As defined in Chapter 2.4, four stakeholder groups make up REC ecosystems: (i) essential entities managing market operations, (ii) ancillary entities and tools advancing REC ecosystem resilience and credibility, (iii) transaction-focused market actors like buyers, sellers, and intermediaries, and (iv) international reporting and disclosure frameworks that define REC procurement rules and clean electricity and carbon accounting standards. The first two groups include essential and non-essential actors and infrastructure for market facilitation. The third and fourth consist of commercial entities and governing bodies crucial for market credibility and growth. Understanding these categories helps policymakers and market participants establish both immediate and future market development goals.

These stakeholder groups collectively define the REC market ecosystem. However, to effectively function, the ecosystem requires clearly established governance frameworks. Governance in REC markets is primarily implemented through documents that define stakeholder interactions, set market rules, and guide market participants on compliance, credibility, and growth. These documents fall into two key categories: primary documents, which directly govern REC issuance and use, and secondary documents, which integrate RECs within broader commercial and regulatory contexts.

Key roles in the REC ecosystem include (i) a REC Standard defining market rules, (ii) a REC registry serving as a central database for all transactions, production data, and consumption claims, and (iii) global and Local Issuers verifying issuance data. Ancillary roles like REC marketplaces and labelling schemes enhance REC market development by facilitating transactions and price discovery, as well as enabling buyers to identify different quality filters across REC products. These functions are supportive of, but not essential for, international market credibility. Market actors include buyers, sellers, and brokers, ranging from IPPs and utilities to corporations and individual households.

While these actors often have REC registry accounts, this is not always necessary and depends on intermediaries' involvement in issuance or redemption. End users aiming to claim renewable electricity usage in a voluntary market usually align with international disclosure frameworks that set the standards for corporate REC procurement and clean energy claims. Ambition frameworks such as RE100 and the SBTi, build upon best practice methodology supplied by the GHGP2, with both frameworks requiring disclosure through CDP scorecards.

## 5.1.1. Primary and Secondary Governance Documents

**Primary REC documents** can include several subcategories, including: (i) global operational documents that guide the market and (ii) national or regional policy or regulatory materials that directly indicate how actors within the given region intend to use the REC market.

The common feature between these is that both documents focus on RECs, rather than including secondary mentions of how RECs are to be used in a wider context.

The first of the above-mentioned category of Primary REC documents sets rules for how to create, transact, and use RECs. These are typically single, comprehensive documents that directly reference RECs and set

a framework for all market participants to engage in their use. Typically, a trusted international entity produces the primary rule system or "Standard".

One such example is the I-REC Standard and its associated Attribute Tracking Standard. This first category is necessary for a market to operate. At the time of writing, the I-REC Standard is operational in all ASEAN markets with the recent approval of I-REC(E) for Myanmar by December 2024 while the TIGRs Users Guide facilitates issuance in Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam.

The presence of these standards in the region means that ASEAN already meets market requirements for primary guidance materials on which to build markets and further nationalise the use of existing structures.

In addition to primary global REC documents promulgated by international actors, some countries or global regions elect to develop regulations or guidance materials that indicate how RECs can or must be used in the given country or region. Rather than set rules for the production and transaction of RECs, national and regional primary REC documents describe specific requirements or guidance for how a REC market is implemented in the given location.

The primary international rules (generally referred to as global REC Standards) are required for a market to operate. National and regional frameworks or standards are optional, but can support market credibility if implemented successfully. Examples of such include the Singapore Standard for RECs (SS 673), with national and regional primary documents under development at the time of writing.

**Secondary documents** are largely commercial materials that reference RECs but which do not have RECs as their primary focus. The most common examples of secondary documents are PPA contracts, which focus on commercial transactions of electricity, but should also directly indicate who is the owner of RECs associated with the PPA.

Secondary documents play a critical role in REC market development and long-term credibility, and often need to be updated to include REC ownership clauses. Where wider energy sector policies govern electricity transactions in a given country, associated policy and regulatory materials should also be updated to indicate any relevant ownership or transactional requirements associated with the domestic REC market.

Another common type of secondary REC document is national or regional energy sector policy or regulation. These materials are generally used to oversee energy sector management and will often indicate that producers and consumers of renewable electricity should evidence associated claims with specific REC systems.

Perhaps the most widely used example of such secondary policy materials is the EU's RED II. While this document focuses on energy sector governance and implementation, it requires that entities making renewable energy production or consumption claims evidence statements with GOs.

## 5.1.2. Options for REC Market Implementation

The transition of REC guidelines into national or regional policy frameworks marks the evolution of the REC market. This process typically involves incorporating REC principles into broader policy initiatives through multi-stakeholder reviews led by national authorities. Such integration is not necessary for the success of a REC market, but can support in aligning RECs with larger energy and environmental strategies, ensuring their relevance and effectiveness within the wider scope of national and regional energy policies.

Countries typically choose from three options to develop national REC markets:

- a. establishing an independent domestic tracking system;
- b. collaborating with existing private market operators; or
- c. deploying a hybrid approach whereby national actors take control of private systems within national borders.

The hybrid model is the most globally used option, and is likely most appropriate in the ASEAN context given the high-level of preparedness and use of current systems, alongside growing interest of national actors to govern and tailor existing systems to meet both national objectives, while supporting end user needs to access credible instruments.

**Public operator model**. This approach requires nations to set up their own domestic REC systems by defining a set of rules (a Standard) and developing the needed IT infrastructure, including a registry and API protocols. It can support long-term independent market growth and a potential shift from a voluntary to a compliance market. However, it involves significant investment of time, money, and effort, usually taking 2 to 3 years to become fully established.

While offering heightened national control, this model also presents substantial implementation risks and high costs, given that the global disclosure frameworks provide no guarantee that the national system will be accepted—and generally fail in cases where they are not national REC markets. National or public operator models may be most appropriate where a country's REC market objectives are focused on RPS systems, and where international buyer needs are not a priority. RPS and nationally managed systems can be seen in South Korea and the Philippines—the systems facilitate RPS compliance but may not address all buyer needs.

**Private operator model**. Here, countries allow established REC market operators like I-REC and TIGRs to operate in a country—either by directly recognising them, or by providing no public recognition, but also no restrictions on their use. This model is relatively common, and the primary advantage is that it requires no public sector engagement, and at the same time, leverages the fact that existing systems are already compliant with global reporting frameworks. This approach is quickest to deploy, but has the disadvantage of not empowering national actors to leverage the REC market to accomplish domestic objectives.

This approach is most common in early national REC markets, where demand from power producers and end users requires REC markets to exist, but where national authorities are reluctant to engage directly. The private operator model most commonly transitions to a hybrid operator model as the market matures and national actors seek to engage more comprehensively.

**Hybrid operator model**. Combining elements of both domestic control and international systems like I-REC or TIGRs, the hybrid model allows nations to align the REC market with their policy and regulatory needs, while leveraging established tracking infrastructure to ensure credibility from the start, alongside implementation and financial efficiency.

Hybrid models are adapted on a country-by-country basis, but all generally seek to strike a balance between control and ease of aligning with international standards, ideal for countries aiming for a gradual evolution of their REC markets. The cornerstones of hybrid models are, (i) the use of existing operators, paired with, (ii) the appointment of a Local Issuer by a national actor to manage and oversee all core aspects of the national REC market.

This model ensures that the instrument meets global requirements and is accepted by reporting frameworks, and at the same time, empowers national authorities to provide additional rules, regulations, and implementation criteria to guide the market.

## 5.1.3. Comparative Analysis of Market Design Approaches

Globally, most REC markets initially adopt the private operator model. As market adoption increases, policymakers often transition to a hybrid model, with some choosing the public operator approach to gain greater control of the market and better align with national objectives.

In the ASEAN/BIMP region, all REC markets began with the private operator model, with most currently in transition to a hybrid approach. The Philippines is notable as the only market that transitioned from a private operator model to a public operator model.

To better understand the implications of each REC market design approach, Table 5-1 provides a comparative analysis of their advantages and disadvantages, while Figure 5-1 summarises the key characteristics of each option. It is designed to help policymakers assess which model best aligns with their objectives and capabilities.

Approach	Public Operator Model (Domestic REC System)	Private Operator Model (Engaging existing REC systems)	Hybrid Operator Model (Combining Domestic and Private Systems)
Advantages	<ul> <li>High degree of control over market rules and procedures.</li> <li>Supports coordination among domestic stakeholders.</li> <li>Well-equipped to track compliance against RPS targets.</li> </ul>	<ul> <li>No costs for development or implementation.</li> <li>Globally accepted by international buyers and MRV systems.</li> <li>Quick market adoption and ease of use by existing participants.</li> </ul>	<ul> <li>Balances international credibility with national control.</li> <li>Customisable to meet national objectives.</li> <li>Faster deployment than building a fully domestic system.</li> <li>Knowledge transfer to domestic actors.</li> <li>Domestic revenue.</li> </ul>

Table 5-1: Advantages and Disadvantages of REC Market Design Approaches

Table 5-1: Advantages and Disadvantages of REC Market Design Approaches



Figure 5-1: Three Models of REC Implementation

The diverse energy sector landscape in BIMP and ASEAN presents challenges for regional cooperation, particularly if countries seek to independently develop domestic REC systems. A purely public operator approach risks fragmenting the region's efforts, leading to inefficiencies and misalignment. Conversely, relying solely on private operator models, such as I-REC and TIGRs, may leave governments without sufficient oversight, ultimately limiting their ability to establish specific rules that reflect local energy policies and goals.

The hybrid approach offers a strategic pathway for ASEAN market development, blending the reliability of established international systems with the flexibility of national oversight and implementation. This model supports rapid adoption and regional integration, and would help ensure that REC markets in ASEAN remain aligned with both national and global standards.

## 5.2. Hybrid Approach in BIMP/ASEAN REC

A key feature of the hybrid approach is leveraging established international REC systems, such as I-REC(E) and TIGRs, which are already trusted by stakeholders across ASEAN and recognized by international MRV frameworks. Integrating these systems within national frameworks enables countries to capitalise on the credibility and efficiency these systems provide, while enhancing control over domestic implementation. The hybrid approach would promote confidence in national markets, while strengthening their connection to the global energy tracking landscape to enhance the region's collective credibility in RE transactions.

By utilising existing systems, ASEAN countries benefit from no implementation costs, increased speed of market deployment, and free capacity-building support from private operators to encourage knowledge transfer into domestic economies. The adoption of international systems ensures market consistency and aligns national REC markets with global energy practices, bolstering ASEAN's credibility in international forums.

**National oversight and Local Issuers**. Local Issuers act as the bridge between international best practices and local preferences for implementing a REC market. They are responsible for:

- a. collecting the preferences of government for REC market management, and facilitating their adoption and implementation into the market;
- b. validating generation data and issuing RECs into the registry, based on either electricity production data or financial settlement data;
- c. acting as the national point of registration for asset owners wishing to open Registrant accounts and seeking to receive REC issuance for generation, including by the Local Issuer being the contract off-taker for Registrants and billing them for associated REC issuance; and
- d. serving as a centralised national knowledge hub for all domestic actors participating in the market.

Countries should start by appointing a Local Issuer to initiate hybrid systems and/or QRE to oversee the domestic markets. The Local Issuer is selected and appointed by a national actor and is designated as the entity that represents REC market governance and implementation in the country.

The Local Issuer is bound by international quality standards (which ensures retention of trust in the national market), but is also empowered to set additional rules that govern who can do what within the national hybrid market. The Local Issuer becomes the primary face of the country's REC market and takes effective control over implementation.

Additionally, while developing primary national governance frameworks can help solidify a market's foundation, this process can evolve over time. Local Issuers and QREs, in collaboration with national authorities, can gradually refine the rules and frameworks based on market insights and operational experience. This iterative approach allows flexibility, ensuring REC markets adapt to evolving national and

regional goals.

**Regional integration**. Beyond individual national benefits, the hybrid approach can strengthen regional integration by promoting uniformity in market instruments and tracking systems—aspects essential for international MRV frameworks to recognise cross-border REC transactions. As countries nationally appoint Local Issuers or QREs, they are also laying the foundation for a regional governance body. This is the case because a regional governance body would require inputs from focal point stakeholders in each country.

The appointment of Local Issuers in each country to implement domestic hybrid models immediately establishes the relevant actor to contribute to the ASEAN version of AIB. The concept of regional AIB in BIMP/ ASEAN could help oversee the harmonisation of REC market rules across BIMP and ASEAN to support standardisation and cooperation among the AMS. This structure would enhance ASEAN's collective bargaining power in response to international policies like CBAM.

As such, the hybrid approach can be instrumental in advancing broader regional initiatives, notably APG. By standardising REC market structures and implementation guidance, the hybrid model could support the settlement of cross-border clean power transactions, facilitating greater electricity exchange between countries. It would accomplish this by empowering the region to collectively demonstrate harmonisation of market rules and implementation to the wider international community—a pivotal step in establishing the credibility of cross-border energy transactions and associated disclosure.

The hybrid approach to REC market design offers the region a pragmatic path forward, blending the consistency of international systems with the flexibility of national oversight. This approach enables countries to adapt their REC markets to national priorities, while remaining aligned with regional and global standards. By incorporating flexibility and scalability into the design, the hybrid model ensures that ASEAN countries can respond to evolving REC practices, new technologies, and emerging market mechanisms. As BIMP/ASEAN amplifies their energy transition efforts, the hybrid approach provides a unified yet adaptable framework, empowering the region to remain competitive in global energy markets, while advancing both national and regional energy goals.

In order to ensure that hybrid approaches at the regional level do not interfere with domestic preferences, it will be critical for each individual country to determine its own preferences for market rollout. Those interested in participating in regional collaboration are encouraged to engage in hybrid system development, while nations prioritising domestic public models may be less interested in developing hybrid systems. To accommodate the different national preferences between BIMP and ASEAN nations, it is essential that any regional guidance structures be developed as optional, non-regulatory, documents that recognise the sovereignty and autonomy of participating countries.

## **5.3. Introduction of ASEAN REC Taskforce**

The ASEAN version of AIB is proposed as a platform to facilitate dialogue among member countries on key regional topics, drawing inspiration from similar mechanisms currently in place in the EU. This platform's intended purpose is to help BIMP/ASEAN nations coordinate their efforts on shared challenges, strengthen

their collective voice in global forums, and align national policies with regional goals.

Although RECAP initially focuses on the BIMP-EAGA sub-region, this report expands the concept to encompass all interested ASEAN member states, reflecting the broad relevance of this initiative for energy markets across the region.

The ASEAN version of AIB will be designed to provide a structured platform for dialogue on topics of regional significance, for a specific targeted stakeholder group consisting of Local Issuers and otherwise designated national entities overseeing national REC market developments. Much like the Heads of ASEAN Power Utilities/Authorities (HAPUA), which serves as a forum for collaboration among utility actors in the power sector, this platform's value lies in creating a space for informed conversations on specific REC-related topics.

Topics of relevance may include how to facilitate and qualify cross-border electricity and REC transactions, and how to capture and express regional preferences related to EAC use as it pertains to CBAM and the designation of REC market governance functions at both the regional and national levels. The platform would be designed to enable ASEAN countries to engage in meaningful discussions, align perspectives, manage disagreements, and shape regional strategies that can be expressed collectively in the global arena.

It is important to recognise that the platform is not intended as a universal solution to ASEAN's energy challenges, nor is it intended to serve as an independent or autonomous organisation. Rather, its role is to encourage dialogue on REC-related topics, specifically among national REC governance bodies, and subsequently to support their integration into wider energy sector decision-making structures. Each country will retain and enhance autonomous oversight of domestic REC markets—most often in alignment with international tracking standards, through the appointment of governance actors such as Local Issuers.

It is equally important to clarify that this ASEAN version of AIB is not a REC standard, nor a registry. Individual countries within ASEAN have already appointed Local Issuers compliant with existing REC standards, such as the I-TRACK and its associated code for electricity (I-REC Code), while other countries in the region are in the process of appointing Local Issuers. Others still, such as the Philippines, have developed independent standards to comply with national RPOs, and have appointed actors to oversee these standards and registries.

The formation of this platform would not interfere with existing structures. Instead, it would create a venue for governance actors in each country's REC market to discuss topics of regional significance and voice preferences, ultimately consolidating ASEAN's collective bargaining power and influence across trade, energy, and commercial sectors at a global scale.

The platform will be designed to facilitate alignment among national actors to enhance regional cooperation. In the early stage, the ASEAN version of AIB will be attached to the existing regional energy cooperation mechanism, which is currently hosted by ACE. It may start as the 'ASEAN REC Taskforce' that comprises appointed (if any) or relevant national entities that assume the role of Local Issuers or QREs.

Continuing the engagement made in RECAP implementation, the task force may consist of similar stakeholders, which are coming from the Renewable Energy Sub-Sector Network (RE-SSN) and BIMP-EAGA Power and Energy Infrastructure Cluster (PEIC). By engaging these stakeholders in structured dialogue, the ASEAN REC Taskforce will enable participants to develop regional approaches, and globally and collaboratively articulate unified positions.

ACE as the host organisation offers the benefit of implementation efficiency in coordinating REC activities with wider energy sector initiatives in the region, including bridging the coordination between RE-SSN with HAPUA, APG with sub-regional grids (LTMS and BIMP). ACE would assume key coordination functions, in line with existing mandates in adjacent groups.

Key topics the ASEAN REC Taskforce could address:

- a. expressing the region's preferences for using REC products under CBAM;
- b. reporting framework recognition of cross-border clean power transactions; and
- c. leveraging the region's RE resources to attract FDI in sectors beyond energy—such as by attracting supply chains and data centres.

## 5.4. Enhancing Regional REC Markets through ASEAN REC Taskforce

This section explores four key areas where the ASEAN REC Taskforce could enhance cooperation and drive market efficiency. By focusing on these areas, the AMS can better navigate the complexities of regional energy markets, enhance transparency, and ensure that their RE products are globally recognised and valued.

**Opportunity 1: Cross-border Power Transactions through APG**. The APG presents significant opportunities for ASEAN, including improving energy security, enhancing resource efficiency, and bolstering the commercial viability of renewables. However, existing global reporting frameworks do not currently recognise cross-border RE transactions outside of select markets in the EU and North America. While framework recognition is not the "make or break" lever for cross-border electricity trade, a lack of framework recognition for cross-border REC transactions may impact end users' willingness to pay premiums for cross-border power, affecting commercial structures and linked infrastructure.

For cross-border renewable trade to reach its full economic potential, it is not enough for electricity off-takers (such as corporate buyers) to receive the physical electricity, they also require the associated environmental attributes. Without these attributes, companies cannot report or claim the "green" benefits of the energy they procure, which limits their willingness to pay premiums for such transactions. Therefore, gaining formal recognition for the transfer of these attributes is essential for ASEAN's cross-border electricity market to grow.

Major reporting frameworks have recommended that governments show at least a minimal bilateral commitment to facilitating cross-border transactions for these to be recognised [73]. Additionally, they must demonstrate, on a bilateral basis, the establishment of robust best practices for managing such transactions. This requirement aligns with specific criteria outlined by RE100 and CDP in a joint working

paper published in November 2023, which examines barriers to cross-border RE trade [74].

At the time of writing, there are no formal structures in place within ASEAN to express the preferences of governments or regional actors for these reporting frameworks. This comes in contrast to the EU, which does have an association capable of expressing collective regional preferences related to REC use and tracking in the EU.

The ASEAN REC Taskforce could take the lead in engaging the relevant national actors in dialogue, formalising the specified criteria as best practices to be applied in the region, and presenting them under a unified front to the global reporting frameworks. Through its coordination functions, the taskforce could highlight the region's commitment to standardised cross-border RE transactions and demonstrate alignment with international leading practices—ultimately advocating for framework recognition of cross-border transactions compliant with the stated requirements of taskforce members.

**Opportunity 2: Defining Stakeholders and Ownership Structures**. Stakeholder interviews and surveys conducted over the course of the RECAP highlight that both buyers and sellers of RECs would benefit from increased information surrounding which stakeholders are able to participate in REC markets, and in what capacity. Additionally, they want to know how contracts and ownership structures affect environmental attribute ownership.

Increasing the amount of public information on these topics, as well as fostering deeper alignment of rules between markets in the region can help scale up transaction volumes and deliver increased revenue into the RE sector. While individual countries in the region have begun entertaining these topics, at the time of writing, there are no formal regional venues for REC market governance stakeholders to share views, preferences, and best practices on these topics.

As such, forming the ASEAN REC Taskforce would introduce both domestic and regional benefits in the areas of increased guidance materials for actors in the region, as well as a deeper consensus and knowledge exchange between governance actors in various markets.

The formation and ongoing success of the taskforce is in part subject to each ASEAN state appointing a Local Issuer or similar REC market governance actor to act as the national representative of their country's REC market in the wider regional context. By bringing together Local Issuers and interim appointees under one body [75], the taskforce could help develop a comprehensive understanding of stakeholder interactions, and ownership structures across the region, creating a shared and transparent repository of knowledge and accountability for REC market governance.

This centralised forum for discussing REC and RE matters would support member states in aligning on both national and regional objectives. Alignment in this manner would support market harmonisation, and reduce the risk of fragmentation, with Local Issuers sharing insights and practices that support the development of energy markets across the region.

**Opportunity 3: Aligning National and Regional Systems to Avoid Risks of Double Counting**. While double counting risks in ASEAN are minimal—due to uniform use of a select few tracking standards and associated registries—the anticipated increase in cross-border transactions will increase complexity and transaction volumes, and may increase risks of double counting, both within REC markets and also

between REC and carbon accounting systems.

As complexity grows, so does the need for coordinated thinking on how national accounting in renewables and carbon interact in the regional energy context. Inconsistencies in how member states define and account for renewable electricity and its associated trade—particularly in methodologies for grid and residual mix calculations, and in the choice of instrument and infrastructure for cross-border transactions—could compromise market integrity or credibility.

The solution to this challenge has two key components. First is the establishment of the ASEAN REC Taskforce, which will serve as a platform for national stakeholders to discuss the foundational elements of both domestic implementation strategies and regional coordination principles. Second is the development of a regional REC framework.

This framework would define international best practices and create uniform rules for REC issuance, tracking, and trade across ASEAN—likely aligning with a global tracking standard that meets end-user requirements. It would also include country-specific sections to address unique national needs.

The framework could be developed alongside or after the formation of the taskforce, which would provide a structured forum for national actors to evaluate and respond to key REC market issues. These include residual and grid mix harmonisation, physical electron tracking, and the suitability of cross-border instruments, among others.

Crucially, the ASEAN REC Taskforce would serve as the custodian of this framework, responsible for its maintenance, dissemination, and the ongoing promotion of best practices. By defining key requirements for cross-border trade acceptance early on, and directly embedding them within the framework alongside country-specific sections that outline each nation's interaction and adherence with the regional standard, the taskforce and its guiding framework would become responsible for facilitating ongoing alignment of regional REC markets with global reporting ecosystems such as the GHGP, CDP scorecards, RE100, and emerging structures such as CBAM and IFRS sustainability reporting requirements.

As such, forming the taskforce and its associated framework for REC management would both reduce risks (whether actual or perceived) of double counting, while also demonstrating consistent implementation procedures relevant to internal credibility.

**Opportunity 4: Leveraging Collective Bargaining Power in External Trade Agreements**. Emerging environmental regulations and disclosure programmes– such as CBAM, IFRS S2, and battery legislation in the EU and North America [76] among others—are increasingly shaping global trade. While traditional compliance mechanisms like RPS largely target utilities in domestic electricity markets, new initiatives focus on environmental and sustainability features that impact trade beyond the energy sector, in an increasingly global context.

CBAM and IFRS, in particular, will eventually encourage and/or require disclosure of sustainability performance metrics as a part of trade and exports, far beyond the energy sector. As it presently stands, the authors believe that there are severely limited venues for national actors in export economies (such

as those across ASEAN) to express their views and preferences for how domestic decarbonisation activities will be factored into wider global or regional disclosure programmes.

Further, since structures like CBAM will represent the import requirements of regions (as opposed to individual countries), questions remain as to the efficacy of individual export economies making proposals or recommendations to wider regional initiatives.

At the moment, a key challenge and opportunity lies in the fact that compliance frameworks like CBAM are still formulating definitions of how market-based instruments can or will contribute to meeting import requirements or disclosure obligations. For instance, while CBAM documentation does indicate that PPAs may be used to support the decarbonisation activities of Declarants, there remains speculation as to how RECs and contractual instruments will need to be packaged and shared to demonstrate the execution of a PPA and associated decarbonisation.

Although many BIMP/ASEAN nations have products that might qualify under existing (limited) guidance materials, individual countries in the region will have limited bargaining power to ensure these structures are recognised by the EU.

A strategic response to this challenge would be consolidating BIMP/ASEAN's clean power offerings under a unified regional position, represented by ASEAN REC Taskforce. Acting as a collective voice, the taskforce could advocate for the inclusion of specific energy and REC products, such as Thailand's UGT, , Peninsular Malaysia's GET), or Viet Nam's new direct PPA (DPPA) structures.

Presenting these products as part of a coordinated regional stance would strengthen the region's ability to negotiate effectively with external trade bodies, increasing product recognition, and reducing potential trade barriers. In doing so, the taskforce would also strengthen ASEAN's wider economic position, particularly as it relates to attracting supply chains and FDI, by establishing clean electricity products capable of reducing tax liabilities for exporters.

While there are no guarantees that the taskforce would succeed in negotiating acceptance of specific instruments, it arguably stands the highest chance of delivering impact in this area, by collecting the preferences of governments from across the region and expressing them in a unified venue.

## 5.5. Establishing the ASEAN REC Taskforce

Concluding the previous two sections, the role of the ASEAN REC Taskforce would be to:

- a. collect national inputs and preference for REC market design and implementation at the regional level;
- b. formally represent the preferences of national and regional REC governance actors to the international community;
- c. ensure that domestic and regional systems remain aligned with global best practices in market design and implementation; and

(iv) act as the custodian of ongoing dialogue and associated governance materials to ensure sustainable market implementation.

Together, these functions would establish the taskforce as the link between domestic, regional, and international REC stakeholders.

As the governing body for REC market oversight in the region, the ASEAN REC Taskforce would facilitate dialogue among member states to establish and align on essential technical standards and best practices for REC issuance, tracking, and reporting. In turn, these efforts would be aligned with global tracking standards.

Similar to organisations like HAPUA, each country would designate a Local Issuer or interim entity to represent national interests within the taskforce, with direction provided through yearly rotational chairmanship and decisions formally documented to ensure clarity and consistency as leadership rotates.

This structure, built upon equal representation and shared leadership, would promote mutual respect and coordination, creating a conducive environment for consensus-based decisions that respect national priorities while encouraging a unified regional approach.

Local Issuers and interim-appointed entities would serve as national points of coordination, contributing to regional discussions relevant to REC market operations and clean power trade, while ensuring compliance with both national and regional frameworks. In the case of significant disagreement among member states, a structured mediation process would need to be outlined to maintain unity. Additionally, the taskforce governance model should be adaptable to support potential expansion into emerging renewable markets, such as hydrogen, biogas, or sustainable aviation fuel (SAF), as demand for these products grows [77].

**Developing a regional framework with country addendums**. A regional REC Framework for ASEAN should include at least three core sections:

- a. a description of international best practices for REC market design and how they are implemented in ASEAN;
- b. expression of regional preferences in target areas relevant to global reporting frameworks and end users, such as how cross-border transactions will be facilitated and/or restricted in the region; and
- c. statements of the individual preferences of countries and how they integrate with or diverge from wider regional systems.

This structure would facilitate sustained alignment of regional and domestic REC markets with international standards and frameworks, while also clarifying how leading practices are applied or adapted within each national context. The framework would be designed to support the sustained autonomy of sovereign actors in designing and implementing REC markets, while at the same time ensuring that all entities engaged in any REC markets in ASEAN have access to transparent rules.

Overall, the framework would be built to foster greater transparency, credibility, and operational

effectiveness across ASEAN's unified REC market, as well as recognising individual country needs.

As custodian of the framework, the ASEAN REC Taskforce would facilitate regular updates to the document—targeting diverse inputs from across member states at regular intervals, to ensure core standards and implementation procedures remain aligned with both domestic and international requirements. The framework would also provide a formal structure for voicing regional preferences, supporting the achievement of opportunities related to collective bargaining power.

**Coordinating the ASEAN REC Taskforce and framework development**. To maximise efficiency, the formation of the taskforce and the development of a regional REC framework should be closely aligned. This can be accomplished either by first establishing the ASEAN REC Taskforce and subsequently having it oversee the development of a framework, or by developing the two in parallel.

The framework should not, however, be designed in advance of the taskforce—this is primarily to avoid the need for retroactive corrections to the framework pending the formation of its governing body. Developing the taskforce first, or the two in parallel, will help ensure that national and regional preferences discussed and captured through regional discussions are ultimately reflected in the framework.

At the same time, establishing these components concurrently or in sequence will help ensure that the taskforce's governance mechanisms are equipped to oversee framework implementation upon launch. To maintain alignment, ASEAN REC Taskforce representatives and national stakeholders should engage in regular communication throughout the development process, to address any operational or regulatory challenges that could impact the framework's rollout.

This synchronised development would also position the taskforce to swiftly adapt to evolving international standards, helping ASEAN meet growing global expectations for market transparency and REC traceability. By advancing both initiatives together, ASEAN can create a more cohesive energy system that seamlessly integrates governance and market mechanisms.

**Practical considerations for implementation**. From a practical standpoint, implementing the taskforce and the regional REC framework will require a tailored approach that accommodates the diverse regulatory landscapes of member states. Unlike the EU, which operates under RED II [78], ASEAN does not have a uniform regulatory structure governing its energy markets. Consequently, the taskforce's governance must respect national sovereignty, allowing each country control over its energy policies, while facilitating regional coordination.

To this end, Local Issuers will play a central role in connecting national REC systems to the regional markets and framework, ensuring alignment between domestic and regional REC market rules. Regular forums for dialogue will facilitate real-time problem solving, allowing the taskforce to address any logistical or regulatory issues that arise during implementation.

Capacity building will be another key consideration, especially for countries still developing REC systems or in the process of appointing a Local Issuer. Targeted support, including training programmes, technical assistance, and knowledge-sharing initiatives, will ensure all member states can fully participate in the regional REC framework.

Understanding the selection of organisations to host the ASEAN REC Taskforce needs a proper dialogue with member countries. ACE, as the likely host candidate, should be able to provide institutional support and leverage existing networks to integrate taskforce activities into broader ASEAN energy initiatives. Given the likelihood of the taskforce operating in line with hybrid models being rolled out in countries across the region, the host organisation should be familiar with both regional and international requirements in the REC market, and be capable of interacting regularly with international market operators (such as the I-TRACK Standard Foundation), as well as with major reporting frameworks such as RE100, SBTi, GHGP, and other key industry stakeholders.

**Core steps for implementation**. The effective establishment of the taskforce and a regional REC framework requires collaborative efforts by national, regional, and international actors to complete several key actions. The steps outlined in this section provide a strategic foundation for future work, with further detail to be designed and integrated by relevant stakeholders during the implementation process.

- a. Define the host organisation and taskforce Terms of Reference (ToR). Select a host organisation with regional energy expertise to lead the taskforce's formation, draft a ToR, and secure initial funding. As noted above, ACE may be an appropriate candidate. It may be appropriate to appoint, either within the host organisation or as a separate third party, an actor to manage standard secretariat functions for the ASEAN REC Taskforce.
- **b.** Select founding members and appoint a chair. Identify founding members with REC market experience and appoint an initial chair from a mature REC market in the region. Founding members are likely to be the Local Issuers, in ASEAN countries that have them in place at the time of implementation, as well as interested government actors in countries that have not yet appointed issuers. It may also be beneficial to adopt a rotational chair model for balanced representation, to be defined in the ToR.
- **c.** Host the inaugural taskforce meeting. Convene the first meeting to finalise the ToR, establish priorities for early activities, and determine near- and medium-term funding models to ensure organisational sustainability.
- **d. Support countries without Local Issuers.** Guide countries without Local Issuers in appointing interim entities and building capacity for full REC market participation through technical assistance, training, and long-term resource development.
- e. Develop a schedule of thematic topics for taskforce meetings. Establish and ratify a two-year schedule of thematic topics to guide ASEAN REC Taskforce activities and support the development of the Regional REC Framework.
- **f. Determine financial or funding models to support taskforce activities.** Multiple structures may be appropriate and should be discussed in early meetings to ensure the taskforce activities are

financially sustainable beyond initial funding.

- **g.** Define the core components of the regional REC framework. Outline the framework's scope, principles, and regulatory guidelines, addressing overarching topics of regional significance, while aligning with international best practices.
- **h. Conduct stakeholder consultations.** Engage stakeholders across the region to refine the framework, addressing national nuances, challenges, and regulatory barriers, to ensure alignment with global standards and regional applicability.
- i. Draft and circulate the regional REC framework. Prepare the framework incorporating stakeholder input and agreed-upon principles. Circulate for iterative review, ensuring all members contribute equally to the final version.
- **j.** Link national frameworks to the regional REC framework. Align national REC frameworks (where they are in use) with the regional system—seeking to standardise operations and infrastructure and ensure the prevention of double counting. Support unification through the inclusion of addendum or local policies and market conditions.
- **k.** Harmonise the framework to facilitate market growth. Implement standardised rules and processes to create a cohesive regional market that streamlines transactions, encourages cross-border energy trade, and attracts global investors. Ensure a maintenance schedule is built into the framework, to identify which entities will be responsible for its upkeep, and on what schedule.



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- [75] In markets that are still in the early stages of REC development, appointing a Local Issuer may not be feasible within the necessary timeframe. In such cases, these countries could designate an alternative entity to act as an interim appointee on their behalf. This would ensure their participation in the taskforce while allowing time for the establishment of a dedicated Local Issuer. The taskforce could support these early markets by providing knowledge sharing, capacity building, and guidance until a Local Issuer can be appointed.
- [76] "Regulation (Eu) 2023/1542 of The European Parliament and of The Council of 12 July 2023
   Concerning Batteries and Waste Batteries, Amending Directive 2008/98/Ec and Regulation (Eu) 2019/1020 and Repealing Directive 2006/66/Ec," Official Journal of the European Union. Accessed: Mar. 26, 2025. [Online]. Available: <a href="https://eur-lex.europa.eu/eli/reg/2023/1542/oj">https://eur-lex.europa.eu/eli/reg/2023/1542/oj</a>

- [77] This approach is similar to the structure of the EU AIB, which provides standardised certification for various energy carriers across Europe under the EECS. The European AIB includes issuing bodies for electricity, gas, and hydrogen.
- [78] "Directive (EU) 2018/2001 of The European Parliament and of The Council of 11 December 2018 on The Promotion of The Use of Energy from Renewable Sources," Official Journal of the European Union. Accessed: Mar. 26, 2025. [Online]. Available: https://eur-lex.europa.eu/legal-content/EN/ TXT/HTML/?uri=CELEX:32018L2001











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