USAID VIETNAM LOW EMISSION ENERGY PROGRAM (V-LEEP)

REC Support to EESD – Deliverable 1: REC Stocktaking and Mapping Report (FINAL)

April 23, 2021

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Prepared by:

Deloitte.

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Disclosure:

During the preparation of these REC reports, one of the independent contractors was also contracted with the I-REC Standard. While the timing of these overlapped, recommendations included in these RECs reports are without bias toward any particular international REC organization.

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Acronyms

ACT	Avoided Cost Tariff
BAU	Business-As-Usual
BOCM	Japan's Bilateral Offset Credit Mechanism
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CfD	Contract for Differences
CO_2	Carbon Dioxide
CREEI	China Renewable Energy Engineering Institute
DMHCC	Department of Meteorology, Hydrology and Climate Change
DNA	Designated National Authority
DPPA	Direct Power Purchase Agreement
DSTE	Department of Science Technology and Environment
EAC	Energy Attribute Certificate
EESD	Energy Efficiency and Sustainable Development
ERAV	Electricity Regulatory Authority of Vietnam
ERU	Emission Reduction Unit
EU	European Union
EVN	Electricity of Vietnam
EF_g	Grid Emission Factor
FiT	Feed-in-Tariff
GEC	Green Electricity Certificates
GENCO	(Electricity) Generation Company
GHG	Greenhouse Gas
GO	Guarantee of Origin
GVN	Government of Vietnam
JCM	Japan Joint Crediting System
JI	Joint Implementation
IPP	Independent Power Producer
I-REC	International REC
IRENA	International Renewable Energy Agency
ISEA	Industrial Safety Techniques and Environmental Agency
ITMO	Internationally transferred mitigation outcomes
JICA	Japanese International Cooperation Agency (JICA)
LULUCF	Land Use, Land-Use Change, and Forestry
MBI	Market Based Instruments
MDMSP	Metering Data Management Service Provider
MOC	Ministry of Construction
MOIT	Ministry of Industry and Trade
MOF	Ministry of Finance
MONRE	Ministry of Natural Resource and Environment
MOST	Ministry of Science and Technology
MPI	Ministry of Planning and Infrastructure
MRV	Measurement, Reporting and Verification
MWh	Megawatt Hour
NAMA	Nationally Appropriate Mitigation Actions

NCCC	National Committee on Climate Change
NDC	Nationally Determined Contribution
NLDC	National Load Dispatch Center
ODA	Official Development Assistance
PC	(Electricity) Power Corporation
PDP	Power Development Plan
PMR	Partnership for Market Readiness
PPA	Power Purchase Agreement
PVN	Vietnam Oil and Gas Group
RE	Renewable Energy
RE100	Global corporate renewable energy initiative committed to 100% RE
REBA	Renewable Energy Buyers' Alliance
REC	Renewable Energy Certificate
REDS	Renewable Energy Development Strategy
RPO	Renewable Portfolio Obligation
RPS	Renewable Portfolio Standard
SBT	Science Based Target
SBTi	Science Based Target Initiative
SDG	Sustainable Development Goal
SPPA	Standardized Power Purchase Agreement
TIGR	Tradable Instrument for Global Renewables
TPE	Third Party Entity
TWh	Terawatt Hour
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
VCGM	Vietnam Competitive Generation Market
VER	Voluntary Emissions Reduction
VLEEP	Vietnam Low Emission Energy Program
VWEM	Vietnam Wholesale Electricity Market
WRI	World Resources Institute
WWF	World Wildlife Fund

Executive Summary

Global interest in renewable energy (RE) generation and procurement has increased significantly over the past decades, driven by growing global demand for electricity, falling prices for RE production, and widespread acknowledgement of the importance of clean energy. Since the 1980's, there have been several concerted international efforts to address climate change and promote clean energy, such as the 1997 Kyoto Protocol and 2015 Paris Climate Agreement. To meet their commitments under these agreements, such as the Nationally Determined Contributions (NDC) defined under the 2015 Paris Agreement, countries like Vietnam, have implemented various laws, regulations, and policies to combat climate change and have employed various tools and market-based instruments to further their greenhouse gas (GHG) reduction goals. At the same time, there has been an accompanying realization that governments alone cannot solve climate change, but that the private sector also has an important role to play. Driven by both ethics and economics, global firms have demonstrated growing commitments to sustainability. Hundreds of the largest multinational organizations have signed on to reporting and commitment frameworks, such as RE100, Science Based Target Initiative (SBTi), and others, that encourage increased consumption of RE and the reduction of GHG emissions.

To meet these commitments, corporates use different methods. Renewable energy certificates (RECs) are among the most important of these tools and are used for tracking and procuring RE. A REC represents the RE attributes associated with one megawatt-hour (MWh) of physical RE generation. RECs not only make attribute ownership verifiable, but they also enable RE markets by making attributes easily trackable and tradable. While RECs are neither carbon offsets nor an accounting instrument used for tracking progress against NDCs, they do help finance the installation of new RE generation, and in turn, and will help decrease fossil fuel share as part of the national power mix – one of the key goals of Vietnam's NDC.

Countries and regions worldwide already have established REC markets that meet the tracking requirements of international commitment framework like RE100 (i.e. RECs in North America, Guarantees of Origin (GO) in Europe, T-RECs in Taiwan, and Green Power Certificates/J-Credits in Japan). There are also two international REC systems that can be applied in countries like Vietnam that do not have formal national systems: the International REC Standard (I-REC Standard) and Tradable Instrument for Global Renewables (TIGRs) Registry. These REC systems enable project developers and consumers to participate in REC sales and consumption, using internationally accepted systems that meet the technical criteria outlined in RE100 and SBTi.

A nascent RECs market already exists in Vietnam, supported by international market operators (TIGRs and I-RECs). However, there is great potential for the market expansion and formalization, and the potential REC market size is large and growing – Vietnam forecasts installed RE capacity of 129,500 MW by 2030. There are various opportunities for the government to work with existing market stakeholders, and to take a leading role in developing the domestic REC market. Doing so can increase RE generation, provide new sources of finance for clean energy, and scale up foreign direct investment beyond the energy sector.

As the Government of Vietnam (GVN) considers its RE future, it can decide how best to engage with the existing REC systems, develop a national system, adopt a hybrid approach, or combine these options. This REC Stocktaking and Mapping Report (D1) assesses international experiences in REC systems and the role of the RECs mechanism for NDC implementation. Two other reports in the series will discuss Options for RECs Development in Vietnam (D2) and REC Policy Roadmap for Vietnam (D3).

Introduction

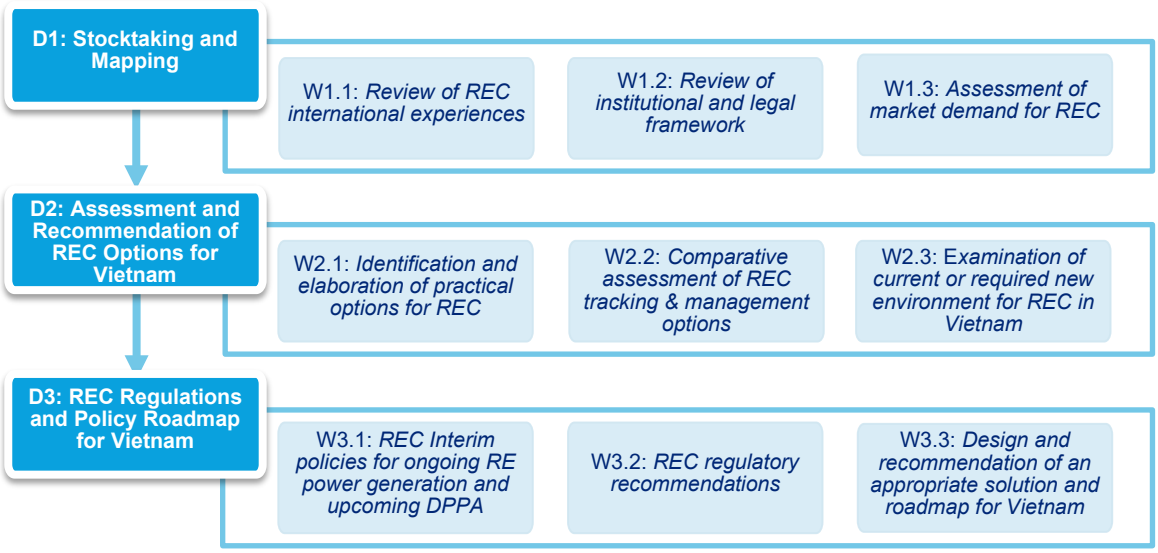
The Electricity Regulatory Authority of Vietnam (ERAV) is working in close collaboration with USAID's Vietnam Low Emission Energy Program (V-LEEP) to design a pilot program that will allow GVN to test the use of a Direct Power Purchase Agreement (DPPA) mechanism so that:

- Accelerated deployment of RE demonstrates its feasibility and value in contributing to the country's sustainable development goal and reducing the financial burden to GVN;
- Global companies and their supply chains can meet clean energy and sustainability targets locally; thus, encouraging additional foreign direct investment into Vietnam; and
- Developers have opportunities to contract directly with creditworthy power consumers using internationally bankable agreements. The DPPA Pilot Program provides an opportunity for GVN to design the underlying agreements that meet international leading practices, to (i) attract competitively priced debt, (ii) allow prices to fall to international norms, (iii) encourage various funding sources, and (iv) further accelerate markets for RE in Vietnam.

Under Report 2.1.1 *DPPAs: An International Review: Assessment of Global Energy Initiatives (*Report 2.1.1*),* V-LEEP conducted a rapid assessment of global initiatives and their reporting criteria to determine if a Contract for Differences (CfD) under a DPPA would be acceptable by the main RE reporting entities to fulfill buyer obligations for consumption goals. The report identified the premier voluntary global initiatives such as RE100, and SBTi, among others, through which companies commit to consuming clean energy; and characterized their requirements, their position in the marketplace, and their success in attracting participants. It also assessed various environmental attribute systems and procurement options for companies to measure and report progress against commitments.

Under Workstream 4: Prepare and Gain Approve of the Legal Framework for the DPPA Pilot program, ERAV has requested that V-LEEP work with the Department of Energy Efficiency and Sustainable Development (EESD) to conduct a study on RECs, also referred to as energy attribute certificates (EACs), to conduct a gap analysis for managing the RECs market in Vietnam, and to identify capacity building requirements in this regard. The workflows under this workstream are illustrated in Figure 1 below.

Figure 1. Mission Workflow



In support of introducing a successful RECs policy in Vietnam, this Report contains three sections:

- **Part 1:** A review of the international experiences in REC tracking and management systems, and the role of a REC mechanism for Vietnam's NDC implementation;
- **Part 2:** A review of the current institutional and legal framework related to RECs in Vietnam; and
- **Part 3:** An assessment of the market demand for RECs in Vietnam.

W1.1 Review of International Experiences in REC Tracking and Management Systems and the Role of REC Mechanism NDCs Implementation

W1.1 of this Report will (i) review international experiences in tracking and managing RECs in support of companies achieving corporate sustainability frameworks; and (ii) discuss the role of REC mechanisms in Vietnam's NDC. W1.1 consists of the following sections:

- **Section 1** provides background on national and corporate sustainability commitments;
- **Section 2** outlines the key components of REC systems, their roles, and provides an overview of global commercial REC market operators;
- **Section 3** discusses the role of RECs in the implementation of NDCs in Vietnam; and
- **Section 4** outlines preconditions for successful application of REC mechanisms in Vietnam based on international leading practices.

1. Background

1.1 From national SDG commitments to corporation sustainable initiatives

Interest in RE procurement has increased significantly during the past decade, driven by growing global demand for electricity, falling prices for RE sources, and widespread acknowledgement of the importance of clean energy. The 2015 Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) signaled an acceleration in the fight against climate change as 196 governments committed to reducing GHG emissions and limiting global temperature increase in this century to 2 degrees Celsius above preindustrial levels. Companies in the commercial and industrial sectors account for about 66 percent of the world's end-use electricity and are working in parallel to international agreements to reduce emissions.[1] This section outlines the growth of corporate sustainability commitments and the mechanisms that have evolved to meet them. There have been several international efforts to address climate change and promote clean energy and the most far-reaching commitments are summarized below:

International Climate Agreements

- **UNFCCC:** UNFCCC is an international environmental treaty adopted in 1992 that outlines how specific international treaties, known as "Protocols" or "Agreements", may be negotiated to specify further action towards the objectives of the UNFCCC.

- **Kyoto Protocol:** The 1997 Kyoto Protocol (Protocol) aims to operationalize the UNFCCC by committing industrialized countries to limit and reduce GHG emissions in accordance with agreed individual targets. Under the Protocol, countries must meet

[1] International Renewable Energy Agency

their targets primarily through national measures, but it also offers three additional market-based mechanisms to meet their targets:

- International Emissions Trading: Allows countries that have emission units to spare – emissions permitted to them but not "used" – to sell this excess capacity to countries that are over their targets.
- Clean Development Mechanism (CDM): Allows a country with an emission-reduction or emission-limitation commitment to implement an emission-reduction project in developing countries. These projects can earn saleable certified emission reduction (CER) credits, each equivalent to one ton of carbon dioxide (CO_2), which can be counted towards meeting its Protocol target.
- Joint implementation (JI): Allows a country with an emission reduction or limitation commitment to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another country, with an emission reduction or limitation commitment, each equivalent to one ton of CO_2, which can be counted towards meeting its Protocol target.

- **Paris Agreement:** In December 2015, the 196 parties came together for the United Nations (UN) Climate Change Conference and signed the Paris Agreement, which set a goal of keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. NDCs are the heart of the Paris Agreement, whereby each country must determine, outline, and communicate their post-2020 climate actions, to reduce national emissions and adapt to the impacts of climate change. Countries set their own emissions target by a specific date, but each target is expected to progress beyond previously set targets.

Compulsory vs. voluntary commitments: cap-and-trade, emission quotas, carbon offsetting

Voluntary environmental markets are ones in which stakeholders can choose to take sustainability actions (such as reducing emissions, pollutants, or fossil fuel consumption); while compliance or compulsory markets are ones in which regulation imposes specific kinds of action. The implementation of both voluntary or compliance market structures can be done at the international, domestic, or subnational levels; and can be based on different environmental attributes and accounting mechanisms. Globally, both voluntary and compliance markets leverage a range of different environmental commodities and products, including carbon credits and RECs. These instruments can coexist and support each other; however, close coordination between associated registries is important to avoid double-counting environmental benefits.

Voluntary and compliance REC markets: In the case of REC markets, the leading international voluntary markets are the commitment frameworks established by RE100 and similar entities. These structures encourage corporations to consume renewable power by providing marketing and communication benefits. Conversely, the most common forms of compliance REC markets are renewable portfolio standards (RPS) or renewable portfolio obligations (RPOs), implemented at the national or subnational level. Under RPS and RPO markets, different entities (often utilities) may be required to produce or purchase a certain portion of RE for their energy mix. RECs are the instrument most commonly used to denominate both voluntary and compliance environmental markets as they pertain to the use of electricity; while carbon and emission markets leverage a range of different instruments (both commodified and not) to track and enforce compliance and reward certain behaviors. It should be noted that a report published in close parallel to the present one (under the Vietnam

Partnership for Market Readiness [VNPMR]) shares detailed information on carbon and emission instruments, while the present report focuses on RECs.[2,3] Complementary aspects between the two reports are identified throughout.

With respect to emission-focused voluntary and compliance markets, countries have employed various tools, such as Cap and Trade, Emissions Quotas, Carbon Taxes, and Carbon Offsetting to meet commitments under the above international agreements.

Cap and Trade: This approach leverages market forces to reduce carbon emissions by allowing the market to determine the price of carbon emissions. Under cap and trade, the government sets a limit (cap) on the total level of emissions by giving each stakeholder a set amount of pollution credits they can use. Stakeholders are taxed if they exceed their allocated emission but can buy or sell (trade) unused emissions. The total cap gets stricter over time, providing a growing incentive for industry and businesses to further reduce emissions. The European Union (EU) has operated a cap-and-trade system since 2005, and estimates that by 2020, the mechanism will contribute to a 21 percent reduction in emissions from sectors covered by the system. Multiple Chinese cities and provinces have also introduced carbon caps since 2012, and the government is working toward a national program. Additionally, several U.S. states use cap-and-trade, and Mexico started a pilot on January 1, 2020.

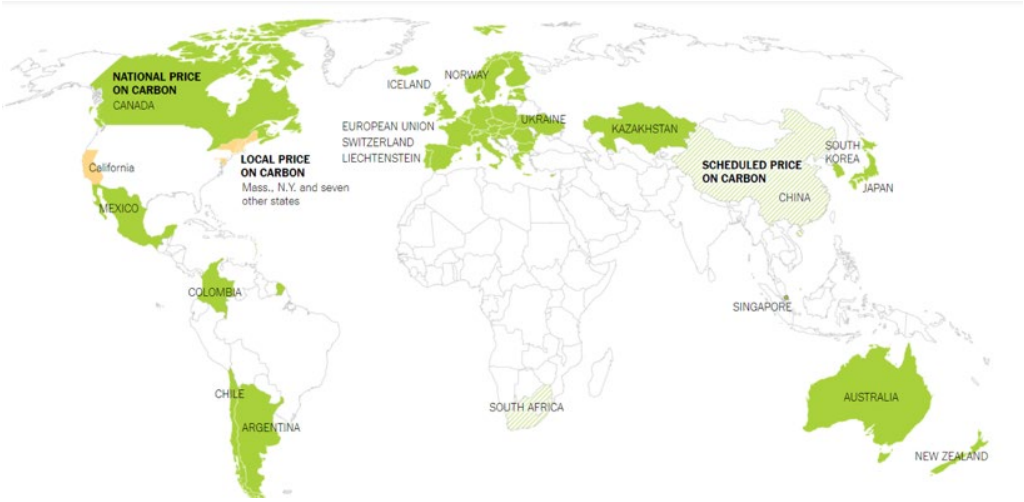
Emissions Quotas: With emission quotas, the government sets a quota for carbon, that each stakeholder can emit. Stakeholders that emit more than their allotted quota, are taxed per ton that they exceed their limit.

Carbon Tax: The government may elect to set a price that carbon emitters must pay, known as the carbon tax, for each ton of GHG emitted. Taxes can be based on emission quantity or applied to goods or services that are GHG-intensive. The tax rate often rises over time. As shown in Figure 2, twenty-five countries currently have a national carbon tax including Canada, Singapore, Japan, and Argentina.

[2] Phylipsen, D. and CEGR specialists. 2020. Task 1: Analytical report on carbon pricing options and recommended carbon pricing policy package. Vietnam: Partnership for Market Readiness Project: Research on market-based carbon pricing approaches, investment and financial policies and instruments. Reference No.: CS1.2. Ha Noi, Vietnam: Centre for Energy and Green Growth Research and NIRAS A/S.

[3] Phylipsen, D. and CEGR specialists. 2020. Task 2: Roadmap and action plan for the implementation of CPIs in Vietnam. Vietnam: Partnership for Market Readiness Project: Research on market-based carbon pricing, investment and financial policies and instruments. Reference No.: CS1.2. Ha Noi, Vietnam: Centre for Energy and Green Growth Research and NIRAS A/S.

Figure 2: Carbon Taxes Around the World



Source: New York Times/World Bank 2019

Carbon Offsetting: A carbon offset is a certificate representing the reduction of one metric ton of CO_2 emissions. It is not confined by location, so often carbon offsets are traded globally. Carbon offsets can be created in several ways: (i) by capturing and destroying a GHG that would otherwise be emitted into the atmosphere; (ii) by producing RE that eliminates the need to produce that same energy from fossil fuels; (iii) by capturing and storing GHG to prevent their release into the atmosphere; and (iv) implementing energy efficiency mechanisms. Companies, governments, and individuals can buy carbon offsets to prove compliance with external carbon reduction commitments and/or to mitigate their own carbon emissions and balance their carbon footprints.

Overview of global corporate initiatives and their reporting criteria

Driven by both ethics and economics, global firms have strong and growing commitments to environmental sustainability. In September 2015, the UN launched the 2030 Sustainable Development Goals (SDGs), which provide a blueprint and proposed approach to encourage sustainable development through 2030. The SDG explicitly call on businesses to help address development challenges, including lowering emissions to mitigate climate change.

Hundreds of large organizations participate in one or more reporting or commitment frameworks, such as the RE100, SBTi, and others; which are aligned with the SDGs. Nearly two-thirds of Fortune 100 and almost half of Fortune 500 companies have set RE or related sustainability targets. Many of these companies have made public commitments to either increase the share of RE used to power their operations, reduce carbon emissions, or both. Report 2.1.1 identifies the premier voluntary global initiatives through which companies commit to clean energy or emission reductions; and characterized their requirements, market position, and success in attracting participants. Key platforms are summarized below.

RE100: is a voluntary platform under which corporations can publicly commit to powering their operations by 100 percent renewable electricity by a specific date.[4] It is designed to "*increase corporate demand for – and in turn supply of – renewable energy, by setting criteria for corporate leadership on renewable electricity, holding members to account, and celebrating their achievements to encourage others to follow*." Companies that join the RE100 are held to accounting standards established in the RE100 Technical Criteria, which is aligned with the GHG Protocol for Scope 2 Emissions Accounting. RE100 companies report their electricity consumption to CDP and use RECs for tracking and reporting transparency purposes.

As of November 2020, 268 companies from a variety of industries had committed to RE100; accounting for over 228 TWh of electricity consumption per year. In Vietnam, the average progress of RE100 members is 52 percent comprised primarily of international companies as shown in Figure 3. This figure also shows the progress of these companies and their target dates for achieving 100 percent renewable electricity.

The GHG Protocol

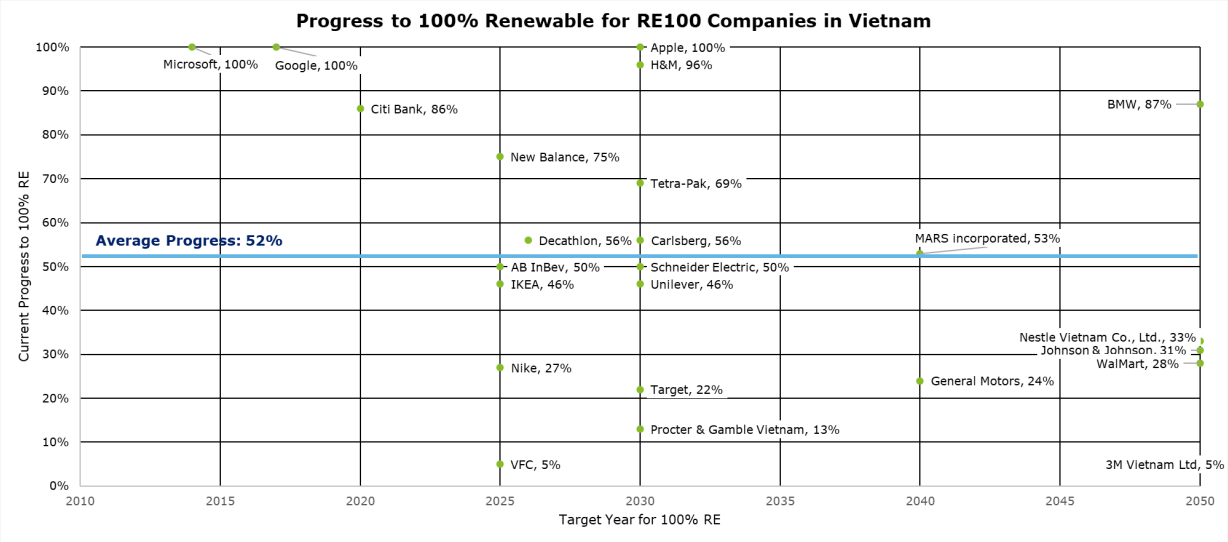
The GHG Protocol establishes a comprehensive global standardized framework to measure and manage GHG emissions and its "*Corporation Accounting and Reporting Standard*" (Corporate Standard) classifies GHG emissions into three scopes:

Scope 1 emissions: Are direct GHG emissions from sources owned or controlled by the company;

Scope 2 emissions: Account for indirect GHG emissions from the generation of purchased electricity consumed by the company; and

Scope 3 emissions: Are all indirect emissions (not included in Scope 2) that occur in the corporate value chain of the reporting company.

Figure 3. Progress to 100 percent Renewable Electricity versus Target Date for RE100 Companies in Vietnam



Source: Deloitte compiled from RE100 and individual company Annual and Sustainability Reports 2018-2019

SBTi: SBTi is a joint initiative by the UN Global Compact, CDP, World Wildlife Fund (WWF), and World Resources Institute (WRI) to make science-based target setting a standard business practice. GHG emissions reduction targets adopted by companies are considered "science-based" if they align with climate science—the level of de-carbonization necessary to maintain a global temperature increase below 2 degrees Celsius, in comparison with pre-industrial temperatures. The goal of SBTi is to make science-based target (SBT) setting a

[4] Each member organization can set its own target date, above or in line with the minimum levels of ambition set by RE100, which are: 30% by 2020; 60% by 2030; 90% by 2040; and 100% by 2050.

standard business practice and have a critical mass of company SBTs by the end of 2020. Science based targets cover scope 1, 2, and 3 emissions (see GHG Protocol box, above); and companies with SBT commitments are encouraged to report progress in line with GHG Protocol for Scope 2 Emissions, and accordingly use RECs to demonstrate power use. As of August 2020, 949 companies had committed to SBTi across a variety of sectors: oil and gas, construction, mining, food products, textiles, real estate, transportation, software, and more.

UN Fashion Industry Charter for Climate Action: The Fashion Industry Charter for Climate Action (the Charter) arose out of UN Climate Change. Launched at COP24 in Katowice, Poland in December 2018, the Charter goes beyond previous industry-wide commitments and aims to achieve net-zero emissions by 2050. The Charter supports the goals of the Paris Agreement in limiting global temperature rise to below two degrees Celsius above pre-industrial levels. It includes a target of 30 percent GHG emission reductions in Scopes 1, 2, and 3 by 2030, and a commitment to analyze and set a decarbonization pathway for the fashion industry drawing on methodologies from SBTi.

As of August 2020, there were over 110 signatories to the charter and an additional 35 supporting organizations. Charter signatories include some of the leading names in fashion, such as Nike, Adidas, Burberry, Gap, Guess, H&M, Kmart, Puma, and Target.

Table 1 below summarizes the compliance requirements for RE100, SBTi and the Charter as discussed in Report 2.1.1.

Table 1: Measuring Compliance with RE Commitments

Commitment Framework	Measuring Compliance
RE100	RE100's technical criteria for compliance are set by the RE100 Technical Advisory Group in consultation with the RE100 Steering Committee and the companies in the campaign. RE100 defines RE consumption as the ability to make unique claims on the use of RE generation and its attributes. RE100 allows members to claim compliance and achieve 100% RE by making claims to self-generation or purchased electricity using RECs. RE100 considers the following as sources for RE: biomass (including biogas), geothermal, solar, water and wind energy sources.
SBTi	SBTi members must ensure compliance with the quality criteria as per the GHG Protocol Scope 2 Guidance. All contractual methods used in the market-based method (using supplier and product specific emissions factors) for Scope 2 accounting must: • Convey the direct GHG emission rate attribute associated with the unit of electricity produced • Be the only instrument that carry the GHG emission rate attribute claim associated with that quantity of electricity generation • Be tracked and redeemed, retired, or canceled by or on behalf of the reporting entity • Be issued and redeemed as close as possible to the period of energy consumption to which the instrument is applied • Be sourced from the same market in which the reporting entity's electricity-consuming operations are located and to which the instrument is applied Companies must also complete a Scope 3 screening as per GHG Protocol Scope 3 guidance and; set targets if Scope 3 emissions are over 40 percent or more of total Scope 1, 2, and 3 emissions, a Scope 3 target is also required.
The Charter	The Charter is not a standard-setting agreement. Instead, it encourages signatories to "quantify, track, and publicly report GHG emissions, consistent with standards and best practices of measurement and transparency,"[5] such as CDP, Carbon Climate Registry, the Climate Group, Global Investor Coalition, UN Global

[5] Fashion Industry Charter for Climate Action, pg. 3 Goal 4.

Commitment Framework	Measuring Compliance
	Compact, Covenant of Mayors, Climate Initiative Bonds, and UNEP Climate Initiatives Platform. The Charter also explicitly highlights the use of SBTi methodologies for analyzing and setting a decarbonization pathway for the fashion industry.

1.2 Overview of corporate clean energy procurement options

Corporations can buy RE in a variety of ways, depending on the local market and regulatory context. Common RE sourcing methods include (1) investing directly in a generation asset, (2) purchasing RECs or EACs as unbundled instruments, separate from physical power, (3) purchasing power from a third party project (bundled with RECs for tracking and accounting purposes), and (4) using green supply contracts from utilities or retailers where available. In most cases, companies seeking to procure 100 percent RE leverage multiple procurement options in parallel; with the composition of options varying widely by country.

1. **Self-Generation through Investment in Renewables:** Companies can generate their own renewable electricity from installations owned by the company. Onsite rooftop solar installations located on company-owned factories are a common approach in Vietnam. These installations can be connected to the grid or not, and onsite or offsite. Companies with their own installations often elect to issue and consume RECs for the power they generate, for accounting purposes. For companies with RE100 commitments, this approach is often the first step for procuring physical renewable electricity, due to attractive payback periods on the investment. However, physical space limitations often mean that this option will only help a company achieve a portion of its RE commitment, and as a result, self-generation is often combined with other approaches. For companies using the self-generation method, it is a common practice to issue and redeem RECs for entirely tracking purposes.

2. **Unbundled REC Procurement:** Companies can purchase RECs to offset their conventional power consumption. For instance, a company consuming conventional "grey or brown" power from the grid can purchase RECs from traders, brokers, or independent power producers (IPPs); and match their physical consumption with RECs to claim they use 100% RE. When RECs are purchased separate from physical power, they are referred to as unbundled. When they are purchased together with physical electricity from a single source (such as an electricity retailer, utility, or IPP) they are called bundled RECs. Unbundled RECs are most commonly sold through traders or brokers.

3. **Power Purchase Agreements (PPAs):** In some markets, corporations can contract with IPPs for physical electricity and the associated RECs. PPAs can be for the direct supply of physical electricity, using a direct line (not the public electricity grid); or they can be financial contracts, paired with RECs; whereby the IPP and buyer agree on a price for power bundled with RECs and use the existing grid infrastructure for delivery. Vietnam's DPPA pilot is a type of PPA and discussed in more detail throughout this report.

4. **Green Supply Contracts with a Power Retailer:** Some power retailers or utilities offer "green electricity" or "green tariff" products, whereby they sell physical power with the guarantee that it has been generated by RE. Reputable green supply contracts are backed by RECs. Under such green supply contracts, retailers either: (1) generate power from RE, issues RECs associated with this power, and transfers or retire the RECs bundled with electricity to the consumer; or (2) purchase power along with the associated RECs, and sell the bundled RECs and electricity to the consumer.

Role of RECs in DPPA implementation

The DPPA Pilot Program allows large electricity consumers to support new renewable power projects through long-term commercial agreements with renewable electricity generation companies (RE GENCOs). Participating consumers receive the titles to environmental attributes (often as RECs) bundled with electricity. RE GENCOs deliver 100 percent of their production into the Vietnam Wholesale Electricity Market (VWEM) and are compensated based on prevailing spot market prices. Participating consumers continue to receive 100 percent of their electricity from Vietnam Electricity (EVN) Power Corporation (PC). The DPPA Consumer and the RE GENCO enter into a long-term contract for differences (CfD) Agreement, which is a private commercial agreement whereby the DPPA Consumer and the RE GENCO settle the difference between a commercially negotiated fixed price per kWh amount (the "strike price") and the spot market price received by the RE GENCO for electricity delivered into the VWEM. If spot market prices exceed the agreed strike price the RE GENCO pays the difference to the DPPA Consumer. In addition to the transactions, EVN, on behalf of its dependent unit, the National Load Dispatch Center (NLDC), will guarantee the RE GENCO priority dispatch in scheduling power deliveries.

One of the main motivations for companies expressing interest in the DPPA Pilot Program is the access to environmental attributes associated with RE generation. These environmental attributes will allow corporations to demonstrate progress towards their RE commitments and obligations. For DPPA Pilot Program to succeed, power buyers under the pilot must receive the environmental attributes from the electricity they purchase. This requires unambiguous recognition that RECs can be owned as a separate and divisible attribute of renewable power generation. The ability to track and transact environmental attributes, in compliance with international reporting frameworks, greatly increase the attractiveness of a renewable power project or transaction for both power buyer and RE GENCO. REC systems enable this.

2. REC Systems

Electricity generation sources are physically indistinguishable from one another once the power enters the grid. As such, the generation attributes for power that enters the grid can only be determined contractually. Therefore, for a company to credibly claim that it is using renewable electricity, it must use a "book and claim" system, which tracks the renewable attributes from the point of generation (at which point the generation is "booked") to the point of consumption (when the attribute is "claimed"). RECs are the book and claim system for tracking the renewable attributes of power from generation to consumption. The required elements of a REC system comprise (i) a set of rules that govern the issuance, use, and activities of relevant stakeholders in the REC market; (ii) the digital infrastructure used to transact RECs, which is often referred to as a registry; and (iii) market stakeholders, often including REC producers, consumers, and traders.

Using RECs enables companies to demonstrate the kind of power they consume, in a transparent, and credible way. Consuming RECs also enables companies to show how they are reducing their Scope 2 emissions, show their preference for RE over conventional fuel, and make credible public claims, including to RE100, SBT, CDP and others.

2.1 How RECs Work

RECs enable the serialization of data associated with the generation of power. RECs are "issued" or created in a registry, which is governed by a set of rules. Each REC represents the generation of one unique MWh of power. Each REC has a serial number, and generally includes information such as where the physical electricity was created, the type of RE used to generate the power, the location and owner of the generation device, and a date stamp of generation (see Table 4 for a list of commonly captured data). This information is verified (typically by a third party) in line with the verification protocols established by the set of

governing rules. The serialization of generation data enables unique ownership of the REC, which protects buyers and sellers from double counting (or concurrent claims of ownership). This unique ownership allows for sale, trade, and consumption of the RE attributes.

RECs have three stages in their lifecycle. They are first issued, then they can be traded, and ultimately, they are used or consumed (often referred to as canceled, redeemed, or retired). Issuance is when a REC is created. It involves one entity (often the RE generator) providing data to a market or registry operator, and the subsequent verification of this data. Once a REC has been issued, it is active in a registry and can be traded. The process of trading, transacting, or selling RECs is when a REC moves between accounts in a registry but is not yet "used" or "retired." A REC can be transacted, traded, or sold multiple times before it is used. A REC trade or transfer does not constitute the consumption of environmental attributes, but merely represents the change of hands between its owners and is often associated with financial transactions. The last stage of a REC's lifecycle is when it is used. Usage constitutes the point at which the REC owner claims (or "consumes") the generation attributes. At this point, the REC is "crossed out" in the registry, indicating that an entity has used it, and that it cannot be sold to or claimed by another entity.

RE100's 2016 *Technical Note on Making Credible Renewable Electricity Usage Claims* (Credible Claims) noted the leading practice requirements for making a credible RE claim, listed alongside the Scope 2 Quality Criteria, as shown in Table 2 below.

Table 2: Credible RE Claim and Scope 2 Criteria

Best practice requirements for credible RE usage claim	Scope 2 quality criteria
Ensuring accurate generation and attribute information	
• Credible generation data • Attribute aggregation	• Convey GHG emission rate
No double counting of generation or attributes between instruments	
• Exclusive ownership (no double counting)	• Convey GHG emission rate • Be the only instrument that conveys that GHG emissions rate • Tracked, redeemed, cancelled by or on behalf of reporting entity
In addition, no double claiming between users	
• Exclusive claims (no double claiming)	• Requirement to use the residual mix or document its absence • Utility specific requirements • Direct purchasing requirements
Matching generation to usage geographically	
• Geographic market boundary limitations	• Market boundary limitations
Matching generation to usage temporally	
• Vintage limitations	• Vintage limitations

Source: RE100 Making Credible Renewable Electricity Usage Claims

Associated attributes of RECS

REC's are designed to catalogue and enable ownership of the non-physical aspects of power generation, or the "attributes" of each MWh. Table 3 below lists the attributes commonly included in a REC, though it is important to note that additional attributes are often added to support specific compliance or voluntary programs at the national or subnational level.

Table 3: Attributes Tracked by System (U.S RPS example)

Certificate Data	Static Data
Certificate Type	State or Province
Tracking System ID	Country
Project Type	NERC Region
Project Name	eGrid Sub-Region
Certificate Vintage	Commenced Operation Date
Certificate Serial Numbers	Fuel Type/Energy Source
Quantity of Certificates	Nameplate Capacity
Meter Data From:	Reporting Entity Type
Meter Data To:	Reporting Entity Contact Company or Organization
Name	Utility to Which Facility is Interconnected
Certificate Creation Date	Repowered Indicator (Y/N)
Utility to which project is connected	Repowered Amount
	Repower Date (required if repowered indicator = Y)
	Qualified Facility (Y/N)

Source: REC Definitions and Tracking Mechanism used by U.S. State Renewable Portfolio Standards Programs

Philosophy and principles of RE certification process: ownership, transfer, and expiration of RECs

Based on RE100's guidance on Credible Claims, there are three guiding principles of the RE certification process: (1) legal enforceability; (2) tracking (exclusive issuance, trading, and retirement); and (3) exclusive sales and delivery.

1. **Legal Enforceability:** Legally enforceable contractual instruments must include "property rights" to environmental and renewable attributes of generation – that is, there must be a legally enforceable contract in place to back the exchange of attributes as property rights. Legal enforceability does not necessarily require governmental programs or legislation to create or recognize a market or energy attribute certificate, only that the mechanism for definition and conveyance/transfer of the attributes (e.g. contract, energy attribute certificate in a tracking system, etc.) is legally enforceable.[6]

2. **Tracking:** To make a credible RE use claim depends largely on reliably tracking RE attributes, verifying exclusive delivery by generators and suppliers, and verifying exclusive ownership of attributes by the end consumer. Allocating RE generation to specific grid customers requires contractual instruments to convey attribute information from generation to end-use. These contractual instruments make specified source purchasing on the grid credible and verifiable. The ability of consumers to know and choose the sources and attributes of their electricity is the underlying premise of most market liberalization and electricity supplier disclosure rules and allows consumer demand to influence RE supply over time.

   Where attributes are transacted without RECs, the transfer of attributes must be clearly articulated in a legally enforceable contract or series of contracts that link the generator to the end user, and claims must be based on the permanent end-use ownership or final use of those attributes, which also must be specified in a contract. Where RECs are used, the certificates must be reliably tracked. However, the most sophisticated mechanism for tracking energy attribute certificates is an electronic attribute "tracking system", in which certificates are electronically serialized and issued to accounts on

[6] RE100 Making Credible Renewable Electricity Usage Claims (2016)

the system, tracked between account holders in the system where they are traded, and ultimately permanently retired or cancelled electronically by the entity making the claim or on behalf of an end-user making a claim. Attribute tracking systems provide exclusive issuance, trading, and retirement of attributes to markets for RE to support credible claims. Where tracking systems exist, transactions outside of the system are usually limited to special cases (e.g. where participation in the system is too costly for small generation units).[7]

While tracking systems have developed independently of each other in different jurisdictions around the globe, there are a few elements that all credible tracking systems have in common. These include:

a) Standardized certificate information- Tracking systems issue certificates in MWh, and include the same basic information on each certificate:

b) Certificates are issued for all RE generated from registered generators- No energy attribute certificates from registered generators should be traded outside of the tracking system, to avoid potential double counting.

c) Defined geographical footprint- To prevent double registration and issuance of certificates, tracking systems must be clear on the geographic boundaries within which generators have access to the tracking system, and ensure, through cooperation with other tracking systems, that generation facilities register in only one tracking system for certificate issuance.

d) Independence and transparency leading practices include:

i. The tracking system operator does not act as a market player trading, selling, or redeeming certificates;

ii. Tracking systems should have transparent and non-discriminatory issuance criteria and operating rules;

iii. Tracking system operators should follow defined procedures to identify and prevent conflicts of interest;

iv. The tracking system should provide access to regulators and system auditors and allow for independent consumer claim verifications. To the extent possible, full disclosure of unit attributes and status should be made public;

v. Frequent independent third-party audit of the tracking system should be conducted by a credible and competent organization, verifying the factual static and dynamic data contained within the tracking system, and preferably made public;

vi. The system should be open and accessible to new participants.

3. Exclusive sales and delivery:

Where tracking systems prevent double counting, tracking systems alone will not necessarily ensure exclusive claims. *Where RECs can be sold separately from electricity, the electricity buyer does not have an exclusive RE use claim unless they own and retire the certificates, and likewise the certificate buyer does not have an exclusive usage claim where the electricity is also being claimed/reported as*

[7] RE100 Making Credible Renewable Electricity Usage Claims (2016)

renewable or individual attributes are being claimed/transacted in another way. This requires that all RE instruments or instruments representing individual generation attributes (e.g., carbon offsets issued for RE generation) have been retired by or on behalf of the same entity and that there are no other usage claims being made on the generation or attributes, for example, by the electricity supplier to meet a RE delivery target or in marketing that RE is being delivered to customers.

2.1.1 Role of RECs systems

REC systems allow for the generation, registry, trade, allocation, and retirement of RECs; all in line with a set of governing rules. The key roles of REC tracking systems include:[8]

1. **Document generator production using metered data**: 1MWh = 1 REC with a unique serial number;
2. **Establish ownership**: Track who owns renewable electricity attributes once generated;
3. **Assure no double counting**: Only 1 certificate per MWh. Project and RECs exist in only one account (for any type of environmental attribute registry) at a time;
4. **Facilitate tracking and/or trading**: of RECs between accounts; and
5. **Verify REC retirements**: to ensure RECs are only used once.

The Role of RECs in Supporting the DPPA Pilot Program

The Vietnam Business Forum created a “Made in Vietnam” initiative that strategized for improving access to power for foreign direct investment. This effort led to the signing of a 2018 corporate letter to the Prime Minster advocating for the creation of a DPPA agreement for Vietnam. A group of 25 companies and organizations in Vietnam, with direct investments totaling US$1.57 billion, annual consumption of 16 million MW, and directly/indirectly supporting the employment of more than 710,000 people, signed a letter to the Prime Minister. This corporate voice spurred the Prime Minister to direct the Ministry of Industry and Trade (MOIT) to develop a new DPPA Pilot Program. This reflects the central importance of RECs in the DPPA Pilot Program.

One of the main motivations for Consumers to participate in the DPPA Pilot Program is to gain ownership of the environmental attributes associated with the RE contracted through the DDPA. Tracking the environmental attributes from the RE GENCO to the Consumer, using a REC system is necessary to meet the sustainability commitments of many potential DPPA Consumers. As such, credible REC systems are an essential tool for ensuring the success of the DPPA Pilot Program. The system should ensure: (1) the time-and-place stamping for generation, (2) the serialization of environmental attributes associated with the generation of each MWh of power to ensure unique attribution of ownership (i.e. no “double counting”); and (3) the ability for buyers to claim the environmental attributes in a credible and transparent way, and in line with global reporting criteria.

2.1.2 Global RECs Registrars

Overview

RECs are essential to make credible claims for RE sourcing and for creating thriving RE markets globally. In emerging markets, such as Vietnam, the purchase of internationally

[8] Center for Resource Solutions

standardized RECs enables businesses to practice consistent RE usage and reporting in all countries of operation. With the increasing demand for RECs outside Europe and North America, the infrastructure for RECs remains crucial to enable companies to credibly claim renewable electricity sourcing.

To be reliable, RE systems must be independent, transparent, and robust; and must fit the requirements outlined in Section 2.1.1 To adhere to the different regulations in each country/region where they are active, these systems have taken different forms, such as RECs in US, GOs in Europe, T-RECs in Taiwan, Green Power Certificate/J-Credit in Japan, I-REC (international) and TIGR (International). The next section focuses on the two global systems.

Operational principles and arrangements of commercial REC Registrars

International REC Standard (I-REC Standard)

I-RECs have been active since 2014 and are governed by the I-REC Standard Foundation—a non-profit organization with the goal of enabling electricity purchasers to make renewable consumption choices in any region of the world. It is possible to implement I-RECs on a voluntary basis; however, the I-REC Standard Foundation recommends that implementation is done in partnership with national regulatory, or policy making authorities. Local issuance of I-REC certificates is administered by an independent entity, preferably acting with recognition or support of local governmental authorities. The issuer controls the registration of electricity production facilities while verifying the reporting of electricity production data, issuing I-RECs based on verified production data. Trade of I-RECs is done digitally through an electronic registry. The I-REC standard is recognized by organizations including the GHG Protocol, RE100 and CDP for reporting the consumption of RE by companies. To date, I-RECs is operating in 35 countries across Asia, Latin America, and Africa.

I-RECS in Vietnam: The first I-REC transaction was completed in Vietnam in late 2015. RECs can be sold to end-users either by the project owners themselves, or through traders. In the case of bilateral transactions, project owners and end buyers negotiate and agree on a price and make the transaction from the owner's account to the buyer's. In the case of transactions involving a third party, traders acquire RECs from project owners (either by purchasing them or by negotiating a revenue-share agreement) and sell onward to corporate buyers, often in response to requests for proposals or direct inquiries from end buyers. For less experienced project owners, trader-managed transactions are more common, while for more experienced ones, long-term bilateral transactions are common.

Between 2015 and September 2020, there have been 47 projects in Vietnam registered with I-RECs. These 47 projects are responsible for 1,107.1 MW of installed capacity, 3.58% of the total installed RE capacity in Vietnam electricity grid. The list of registered projects under I-RECs are shown in Annex 1. Projects in Vietnam Registered with I-RECs. More recently, Gia Lai Electricity Joint Stock Company (GEC)'s Phong Dien solar power plant has worked with I-REC to create certificates, and the Krong Pa plant has signed a contract to register the project on the system according to the I-REC Standard Foundation.

Tradable Instrument for Global Renewables (TIGR) Registry

The TIGR Registry was launched in 2016 by APX and enables power buyers worldwide to track environmental attributes using consistent, standards that ensure ownership and protect against double counting. The TIGR Registry issues to support PPAs, onsite generation and tracking, green tariff, and bundled power programs (power and RECs), and unbundled REC transactions in more than 40 countries. The TIGR Registry enables developers to generate, verify, track, and sell RECs anywhere in the world on a country-by-country basis, while managing all assets in a single online portal. TIGR allows companies to document their sustainability efforts while providing transparency to the market. Participants can register for

online accounts, register renewable assets and only after undergoing rigorous validation, can begin to issue RE credits, referred to as RECs or TIGRs.

TIGRs can be issued using a third-party local reporting entity that verifies the metered production data, or by requesting that APX validate information through a document review process or by remotely reading meters. Once the certificates are issued in the TIGRs Registry, they can be transacted and used for corporate claims for compliance with all major RE reporting frameworks.

TIGR in Vietnam: TIGRs are actively traded in Vietnam. A total of 4,064 and 60,511 TIGR certificates were issued for solar generation projects in 2018 and 2019 respectively. In 2020, there have been 24,470 TIGR certificates issued for solar generation to date.[9] There are currently three assets, one wind and two solar projects, registered in the TIGR Registry as shown in Table 4 below.[10]

Table 4: Projects in Vietnam Registered with TIGR Registry

Account Holder Company	Asset Name	Capacity	Fuel	COD
Gaia Environment S Pte Ltd	Phong Dien solar power plant	35 MW	Solar	10/10/2018
Monsoon Carbon Pte Ltd	Phase 1 and 2 - Dam Nai Wind Farm Phase 1 and 2	39.4 MW	Wind	11/20/2017
T-RECs Energy	TTC Duc Hue 1 Solar Power Plant	49 MW	Solar	04/20/2018

Comparison of I-RECs and TIGR

Table 5 below provides a summary comparison of the two global RECs registrars. V-LEEP consultations with I-REC and TIGR confirm that registering RECs requires only that the project owner/RE GENCO provide invoices from the off-taker detailing the MWh output over an invoicing period (daily, weekly, or monthly).

Table 5: Comparison of I-RECs and TIGR

	I-RECS	TIGR
Summary	Both a code for tracking systems and a tracking system in itself	Online platform for tracking and trading RECs
EAC Type	I-REC certificates 1 REC = 1 MWh	TIGR certificates 1 REC = 1 MWh
Third Party Oversight	• Third party must verify generation to register MWh in I-RECS. • Local issuance of I-REC certificates is administered by an independent local issuer, which could be GVN. • Third party verification of REC holdings.	• Third party verification of generation via independent reporter (the QRE, which could be GVN) or meter reading. • Consultations with local stakeholders, including private sector, government, and utility counterparts to support market integration.

[9] https://tigrsregistry.apx.com/ng/Report/getdto_view_Report_Public_CertificateByYearCtryFT
[10] https://tigrsregistry.apx.com/ng/Report/getdto_view_Report_PublicProjectsAll

	I-RECS	TIGR
Compliance	RE100; CDP, GHG Protocol, Leadership in Environmental and Energy Design (LEED), Green-e, Peace RECs, and other leading sustainability entities	RE100; CDP; GHG Protocol; SBTi; LEED; We Mean Business Coalition; Business Renewables Council; Renewable Energy Buyer's Alliance; Green-e Standard, and other leading sustainability entities
Retroactive REC issuance	Up to 12 months.[11]	Up to 2 years
Cost	Fees include: Account, project registration, and volumetric fees for issuance and retirement/redemption http://irecstandard.org/assets/doc_3983.pdf	Fees include: Account, project registration, and volumetric fees for issuance and retirement/redemption In case the QRE is selected for verification, an additional fee for this service will be charged, which is independent of TIGRs fees. http://apx.com/wp-content/uploads/2018/09/TIGR-Fee-Schedule-September-2018.pdf
Global Presence	40+ countries, including Vietnam	40+ countries, including Vietnam

3. Role of RECs in the implementation of NDCs

NDC targets under the Paris Agreement align government policies and actions with the international climate change agenda. NDCs contain both mitigation and adaptation components. Adaptation components focus on how a country will prepare for and cope with the impacts of climate change, and as such, RECs are of little relevance to adaptation objectives. Conversely, mitigation components describe ways in which a country will contribute to lowering emissions against the business-as-usual (BAU) scenario, and RECs are highly relevant for achieving these commitments.

According to Vietnam's NDC, total national emissions amounted to 246.8 million tons of CO_2 equivalent ($MtCO_2e$) in 2010. The NDC estimated that emissions would grow 93 percent to 474.1 $MtCO_2e$ by 2020 and will reach 787.4 $MtCO_2e$ by 2030 under the BAU scenario (excluding industrial processes). Under its NDC, Vietnam committed to:

- Unconditional contribution: Reduce GHG emissions by 9% as compared to BAU by 2030; and
- Conditional contribution: the reduction target may be increased to 27% with international support through bilateral and multilateral corporation and the implementation of new mechanisms under the Paris Agreement.

[11] The earliest date of project registration that can be requested by an applicant must be no earlier than 12 months prior to the date on which the registration application is received by the Issuer, so in theory, the retroactive period could be up to 12 months prior to the date of submitting project for registration.

Mitigation targets are organized into a number of sectors including energy, agriculture, waste, and Land Use, Land-Use Change, and Forestry (LULUCF). Energy sector contributions represent the largest component of Vietnam's sectoral decarbonization targets, as pictured below. Within the energy sector, Vietnam has committed to: "Developing renewable energy in accordance with Viet Nam's potential, advantages and conditions." RECs can play a key role in increasing the installation of renewable energy in Vietnam, by supporting increased financing for project developers, at decreased costs to the public sector. Table 6 below shows Vietnam's proposed reduction contributions by sector.

Table 6: Vietnam's Proposed Reduction Contributions by Sector

Sector	Contribution with domestic resources		Contribution with international support		Total contribution with both domestic resources and international support	
	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO_{2eq})	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO_{2eq})	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO_{2eq})
Energy	5.5	51.5	11.2	104.3	16.7	155.8
Agriculture	0.7	6.8	2.8	25.8	3.5	32.6
LULUCF*	1.0	9.3	1.3	11.9	2.3	21.2
Waste	1.0	9.1	2.6	24.0	3.6	33.1
IP	0.8	7.2	0.1	0.8	0.9	8.0
Total	**9.0**	**83.9**	**18.0**	**166.8**	**27.0**	**250.8**

Note (*): increase in GHGs sequestration

Source: NDC Registry, Viet Nam Updated First NDC. 2020. Updated Nationally Determined Contribution. Hanoi.

3.1.1 Analysis of the role of RECs in achieving unconditional and conditional GHG mitigation targets.

RECs can play an essential role in supporting Vietnam to meet mitigation targets under its NDC. However, it is important for policymakers to understand how they can and cannot be used with respect to achieve NDC targets. First, policymakers should recognize that RECs are different from carbon credits and are not an instrument that can be traded between countries to directly claim progress (emission reductions) under an NDC target. With this concept as a backdrop, it is possible to discuss the application of RECs for helping to meet NDC targets.

A REC is a claim that a MWh was produced using RE. Often, this claim can be used to indicate that the production of power did not create any Scope 2 emissions. However, this claim does not serve the same function or convey the same meaning as carbon offsets. In contrast, a carbon offset (measured in $MtCO_2e$), represents a reduction in emissions of CO_2 or other GHG (against a projected baseline) which can be used to compensate for emissions produced elsewhere. Certain carbon schemes can be used across borders to support national GHG emission reduction targets. Carbon credit instruments include the Clean Development Mechanism (CDM), the Verified Carbon Standard (VCS) and the Gold Standard. Each carbon scheme has its own set of rules and criteria, and interfaces with NDCs and international carbon markets to varying degrees—the present REC report does not endeavor to provide a comprehensive overview of carbon schemes, and instead focuses on how RECs can be applied to achievement of NDC targets.

The core ways in which RECs can be used to support Vietnam in achieving NDC mitigation targets include: (1) helping increase finance for renewable power generation; (2) supporting the decarbonization of industry, and specifically Scope 2 emissions within it; and (3) enhancing accuracy of GHG emission reporting and inventories, specifically in the power sector.

Financing RE Generation

As a market-based instrument, RECs can help (1) encourage the installation of more renewable power generation, and (2) transfer some or all of the financial responsibility for incentivizing the installation of renewable power generation away from the government and on to the private sector (or other consumer classes, like utilities). This is the case because corporations are willing to pay more for renewable power than conventional power, but require RECs to prove that the power that they are paying for – the renewable attribute of the generation of power – is in fact real, unique, and delivered only to a single buyer.

Applying RECs to voluntary markets is one way of incentivizing the installation of more RE generation units, while applying RECs to compliance markets is a more aggressive way of doing so. Voluntary markets often feed into compliance markets, and the gradual transition – and in many cases, coexistence of the two – has shown itself to be a powerful tool for encouraging new renewable generation to be built. In both voluntary and compliance markets, the use of RECs increases capital flows for RE GENCOs and supports the installation of new RE. Furthermore, where project financing for RE is constrained, forward purchase agreements for RECs (or RECs + electricity, as in PPA structures) can support the bankability of projects, thereby reducing financing barriers for RE GENCOs.

Decarbonizing industry

Industry accounts for 55 percent of energy consumption in Vietnam, and a significant portion of industrial emissions from electricity consumption (scope 2 emissions). As Vietnam seeks to decouple emissions from economic growth, the procurement of RECs in the commercial and industrial sector will support a corresponding reduction in sectoral scope 2 emissions. For instance, if a given company has annual emissions of 100 $MtCO_2e$, and 20 percent of its emissions come from electricity consumption, then the procurement of RECs to "green" its electricity consumption will lead to a 20 percent reduction in its overall emissions. The fact that many companies are seeking to take these actions voluntarily creates a best-case scenario for sectoral decarbonization in Vietnam—whereby the country can register progress toward its NDC targets as a result of corporate ambitions to procure clean power. The key to capturing these benefits is to ensure appropriate REC tracking systems are available for corporations to use for meeting their voluntary commitments.

GHG Inventories

Although REC systems are different from GHG inventories, they can be used to support calculation of emission and emission intensity, specifically in the power sector. For instance, REC tracking systems can be expanded to include generation attributes for all sources of electricity (renewable and non-renewable). "All attribute tracking systems" can be used to accurately calculate the emission factors of a grid, and the specific carbon intensity of electricity consumed by different entities. All attribute tracking systems are typically more robust and accurate than using residual mix calculations and can also support further accounting and future compliance programs. However, the transition from a market in which *some* power generation is registered in a REC system, to a complete energy attribute certificate scheme (in which all power generation is tagged) is a complex and gradual process. As such, support from REC systems for tracking power sector GHG emissions can be set as an aspirational target, and integrated into long-term planning for the power sector.

3.1.2 Analysis of the impact of REC ownership on NDC monitoring and reporting

Domestic entities are often concerned that REC markets will conflict with country's ability to achieve its NDC targets. This is based on the misconception that REC transactions will restrict a country's ability to claim green benefits associated with power sector reforms. However, NDC targets for RE typically relate to the production, not consumption, of renewable power. Since targets are set around installations (the ability to produce), the focus of NDCs in the power sector is to encourage more RE power plants to be built. This is markedly distinct from goals targeting the consumption of RE. In sharp contrast, RECs are used to measure the production and consumption of a unique MWh of power.

Since NDC energy targets focus on *installed generation capacity,* they operate in relative isolation from corporate RE *consumption targets.* For a country to report progress toward its NDC (in terms of renewable power) it wants to show how much installed capacity there is—not how much of this power is being consumed by who. As such (and at present) the production and consumption of RECs within a given country does not negatively affect the nation's ability to claim progress against its NDC targets.

4. Pre-conditions for successful application of REC mechanisms in Vietnam based on international leading practices

According to International Renewable Energy Agency (IRENA) 2018 Corporate Sourcing of Renewables Report, companies in 75 countries sourced renewable electricity either through PPAs, utility green procurement programs, or RECs. Leading practice suggests that companies should source certificates, by country, within the market where it consumes or purchases electricity. For successful implementation of purchased renewable electricity schemes, a government should ensure:

1. A credible and transparent system for certification and tracking RE attributes. This can be either a domestically owned and operated platform, or an international platform such as I-REC or TIGR that operates within the country. Transitions between the two, or simultaneous operation of tracking systems are common. In its Corporate Sourcing Report, IRENA noted that depending on the market, responsibility for issuing, tracking, and verifying RECs should fall under the purview of either a government or private independent issuing body with tracking done using either electronic systems or contracts.

2. Allowance for direct trade between companies of all sizes and RE developers, such as through PPAs. Enabling frameworks may help stimulate PPAs including electricity retail prices which closely track wholesale prices. For a CfD, this is particularly important as payments are based on the market reference price. Most PPAs are large-scale and built off-site, thus creating larger and more integrated electricity grids, potentially lowering costs[12]. This will enable smaller companies to enter PPAs. Companies must retain any attribute certificates associated with the electricity production to prevent double counting. A robust REC system can support this.

3. Engage with utilities or electric suppliers to provide green corporate procurement options.

Importance of a successful RECs policy in Vietnam to the DPPA Pilot Program.

[12] Bird et al (2017), Policies for Enabling Corporate Sourcing of Renewable Energy Internationally: A 21st Century Power Partnership Report, National Renewable Energy Laboratory, Golden, CO.

A REC policy (or the DPPA policy note) needs to guarantee that developers and/or end buyers are the only entities under the DPPA that will have exclusive rights to the RECs produced by the project, in perpetuity. Without this assurance, buyers will be hesitant to participate in the DPPA Pilot Program.

4.1 Legal and institutional review of other jurisdictions for tracking generation and consumption of RE in key markets including Singapore, China, and US to meet reporting criteria

In general, the standard practice for governments is to establish a REC ecosystem or to contract an external entity to provide REC market services, based on nationally determined market rules. Domestic REC market platforms include governing rules for the REC system and an electronic REC tracking system to verify REC claims—both the governing rules and tracking system should be aligned with international leading practices and meet the criteria for reporting frameworks like CDP and RE100. To do that, governments may choose to introduce their own system or use a global tracking system that can be customized for individual countries, such as I-RECs or TIGR. Without the use of electronic REC tracking systems, purchasers must rely solely on contract audits and paper attestations. Electronic tracking systems significantly reduce the administrative requirements to prevent double counting. This section examines a few leading key markets, the U.S., Singapore, and China, and evaluates their experiences in tracking the generation and consumption of RE. Some key takeaways include:

- Electronic REC tracking systems ease the tracking and reporting of RE because they are highly automated and secure;
- The international standards such as I-RECs and TIGRs eliminate pressures on government oversight and development but can be modified to meet local conditions; and
- Regardless of whether a business retains or sells the RECs, it should ensure that contracts clearly define the environmental attributes and attribute ownership.

U.S.

The U.S. use two approaches for tracking renewable electricity and its ownership in energy markets (i) Certificate-based Tracking Systems and (ii) Contract-path Tracking Method.

Certificate Based Tracking Systems

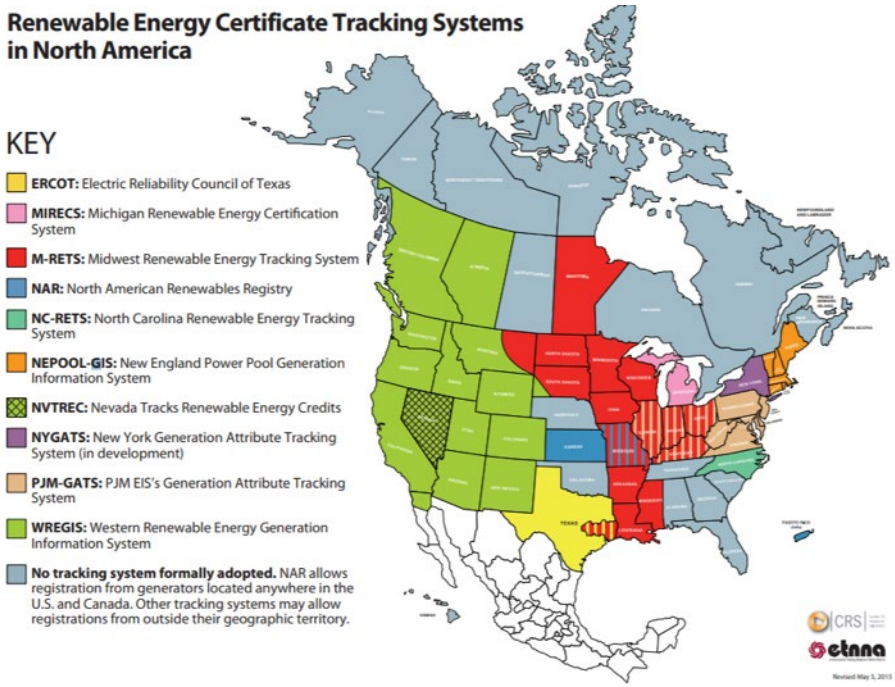
Tracking systems are typically electronic databases that track information about RE generation in a specific region. RECs are issued to the generator, signifying that a MWh of renewable electricity has been delivered to the grid. RECs are then used to track renewable electricity from the point of generation to the consumer. The U.S. REC mechanism was developed as states began passing an RPS and requiring fuel mix disclosure labels. The U.S. has ten regional electronic REC systems, shown in Figure 5, which oversee the creation, management, transfer, and retirement of RECs. The tracking systems ensure that each REC is counted only once by assigning a unique serial number to each MWh of RE generation. Regional REC tracking systems have also begun interacting with each other, allowing RECs to be exchanged across regional tracking system boundaries.

These REC tracking systems only monitor wholesale transactions and therefore require additional third-party certification and verification. Retail RECs generally make their way through several wholesale intermediaries and brokers until they are sold to retail electricity suppliers, who in turn sell them to an eventual end-consumer. Some states have renewable portfolio standards mandating that a certain percentage of electricity produced must use

renewable sources. U.S. regulators use the REC tracking systems as: (i) a registry of eligible generating facilities; (ii) a means of verifying compliance with state RPS; (iii) an aid in the creation of electricity disclosure labels; (iv) to demonstrate compliance with mandatory fuel disclosure options and simplify audits; and (v) to verify wholesale supply for green power products. U.S. regulators set standards for the level of public information available from REC registries, including the total number of RECs that have been created, their location, resource type, and other key statistics.

REC tracking systems have emerged as the preferable method for tracking wholesale RE because they can be highly automated, preserve the integrity of trades, contain specific information about each MWh, and are accessible virtually to all market participants.

Figure 4. REC Tracking Systems in North America



Source: EPA

Contract-Path Tracking Method

The contract-path tracking method is the oldest method to verify, track, and trace the chain of custody of RE ownership from a generator to the end-consumer. The contract-path tracking approach assumes that a consumer's green power portfolio is the sum of its energy supply contracts. This tracking method includes a third-party audit supported by declarations, sworn statements, contract receipts, and other proof of generation and transfer of ownership (e.g., between a generator, intermediary, or final marketer) to the ultimate end-consumer. Metered generation data is often used to support and verify such attestations and supply contracts.

Consumers that buy third-party (independently) certified and verified green power products can be assured that the green power they are buying has been found to meet nationally accepted standards for product quality, that their purchase is supported by RE supply contracts that meet the retailer's advertised product, and that their purchase is uniquely their own (not double counted). The cost of this method varies but is generally higher and more time consuming than the automated tracking systems mentioned above.

Singapore

Unlike the U.S., Singapore does not have RPS regulations, making Singapore a voluntary market driven by companies that want to commit to clean energy. Singapore employs a variety of electronic systems to track RE generation and consumption, including both I-RECS and TIGR. TIGRs first originated in Singapore. In 2016, APX announced both the launch of a new product for the voluntary RE markets – TIGRs – and the creation of the Clean Energy Registry to generate, transfer, and track TIGRs for solar projects in Singapore. TIGRs have since expanded to other renewable sources and regions but remain a dominant force in Singapore.

I-RECs are also used in Singapore. In 2019, SP Group, a leading energy utilities group in Asia that owns and operates electricity and gas transmission and distribution businesses in Singapore and Australia, was officially approved by the International REC Standard as Singapore's issuer of I-RECs. As the sole authorized local I-REC issuer, SP Group oversees the domestic market and ensures the avoidance of REC double counting through its rigorous validation and verification processes of local RE generation facilities in accordance to the I-REC Standard. SP Group maintains an online market platform that utilizes blockchain technology to track the lifecycle of a REC – form issuance to transfer to redemption – and facilitates the transaction of RECs. Although only generation facilities that wish to be registered under the I-REC Standard will be issued RECs through SP Group, the SP REC Platform is open to interested parties globally for the trading of all internationally recognized RECs, including TIGRs. The I-REC Standard has also been awarded a contract by the National Environment Agency (NEA) of Singapore to provide RE certification services. This allows NEA to register RE assets on the I-REC registry, and issue, transfer and redeem certificates.

China

RE tracking in China is still the in the developing stage. China has used I-RECs, TIGRs, and national Green Electricity Certificates (GECs) in the past, each of which have faced barriers to wide-scale implementation. I-RECs and TIGRs, for example, are not formally recognized by the Chinese Government, while GECs are not recognized by key sustainability platforms.

GECs

In January 2017, the Chinese National Development and Reform Commission, Ministry of Finance and National Energy Administration jointly launched a pilot GEC mechanism in China, maintained by the China Renewable Energy Engineering Institute (CREEI). Currently, onshore wind and solar PV projects (excluding distributed generation) are eligible for GECs. Although RECs are traditionally designed to show proof of RE generation and use, the Chinese GEC mechanism was developed primarily to reduce Feed in Tariff (FiT) subsidies. RE generators that are approved to receive the FiT can choose to instead be issued GECs on CREEI's exchange platform and sell the certificates to customers wishing to make a renewable energy claim on their operations. GECs are not allowed to be resold and therefore are not available for retailers to procure and sell to their customers. Although there is considerable supply, demand for GECs has been low (Table 7). This is due to several factors, including high price (GECs are sold at a premium), mandatory linkage to the FiT, unavailability for all RE, and the lack of international approval. However, a new policy released in early 2019 opens GECs to projects not receiving the FiT. This provides more opportunity for large purchasers to support projects that would otherwise not receive any government subsidies.

Table 7: I-RECs and GECs in China

	I-REC	GEC
Established	2015	2018
Regulator	I-REC Standard	China National Energy Administration
Scope	International	PRC
Purchaser	Corporate User	Corporate/Personal User

	I-REC	GEC
Market	Voluntary	Voluntary
Energy Source	Wind, Hydro, Solar, Biomass	Onshore Wind, Solar
Generation*	18,706,000 MWh	26,918,591 MWh
Traded Amount*	11,214,000 MWh	34,691 MWh
Recognized by CDP	Yes	No
Recognized for Scope 2	Yes	No

**As of November 2019*

In May 2019, China passed its RPS that sets annual RE targets for each province. This could further incentivize the use of GECs. Under the RPS, grid companies, electricity retailers, electricity buyers in the wholesale market, and power plant owners are required to contribute to the overall provincial RE target. Each province must design implementation details, including targets for each covered entity, tracking, and enforcement. Demand for RECs is likely to grow quickly when regulators confirm who must fulfill the RPS and establish RECs as an option to fulfill their obligations.

4.2 Technical ability to record and track power deliveries

It is important to understand what data files are included in a REC and what may need to be included if the tracking system must import/export RECs to other systems. The systems must also be flexible, so that data sets can be modified to track other types of attributes in response to policy changes.

4.2.1 Key/critical elements of an appropriate registry

Based on RE100's Credible Claims, environmental attribute registries must meet the following criteria to be consistent and compliant with leading international renewable energy commitment frameworks:

- Credible generation data
    - Fuel type, location, date of first operation, etc. should be third-party verified and quantity of generation should be metered using a revenue-grade meter.
- Attribute aggregation
    - All environmental and social attributes associated with the generation that can be owned should be compiled, regardless of if in multiple systems or not
- Exclusive ownership (no double counting) of attributes
    - Legally enforceable contract to back the exchange of property rights
    - Transfer of attributes must be clearly articulated in legally enforceable contract that link the generator to the end user
    - Standardized certificate information
    - Defined geographical footprint
    - Independence and transparency of tracking system
- Exclusive claims (no double claiming) of attributes
    - All instruments representing individual generation attributes must be retired by or on behalf of the same entity and there are no other usage claims made

Existing registries that meet these strict criteria include: RECS (US and Canada), GOs (Europe), T-RECs (Taiwan), Green Power Certificates/J-Credits (Japan), Australian RECs, Indian RECs as well as the international registries: I-REC and TIGR.

4.2.2 International standards and other relevant Buyer principles

The Buyer Principles were founded by WWF and WRI and are now run by the Renewable Energy Buyers' Alliance (REBA). The Buyers Principles frame the challenges and common needs faced by large RE buyers and inform utilities and other suppliers of industry-leading, multinational companies needs when buying RE from the grid. They outline six criteria that would significantly help companies meet their ambitious RE purchasing goals:[13]

1. *Choice: Greater choice in procurement options - It is important to have choice when selecting energy suppliers and products to meet our business and public goals.*

2. *Cost Competitiveness: More access to cost competitive options – Buyers would like the opportunity to buy RE that accurately reflects the comprehensive costs and benefits to the system.*

3. *Long Term Pricing: Longer and variable-term contract - A significant part of the value to Buyers from RE is the ability to lock in energy price certainty and avoid fuel price volatility. Many Buyers want options for entering into contracts over various time periods.*

4. *New Projects: Access to new projects that reduce emissions beyond BAU -Buyers would like efforts to result in new renewable power generation. Pursuant to the desire to promote new projects, Buyers want to ensure that purchases add new capacity to the system, and that they buy the most cost competitive RE products, such as:*

    - *Access to bundled RE products*
    - *Ability to prevent double counting within the energy consumer community to claim the benefits of our RE purchases to satisfy our public goals and reduce our carbon footprint.*
    - *RE delivery from sources that are within reasonable proximity to our facilities to benefit local economies and communities and enhance the resilience and security of the local grid.*

5. *Financing Tools: Increased access to third-party financing vehicles as well as standardized and simplified processes, contracts, and financing for RE projects. Simplifying and standardizing policies, permitting, incentives and other processes for direct procurement are high priorities for many companies.*

6. *Cooperation: Opportunities to work with utilities and regulators to expand choices for buying RE.*

4.2.3 Third party independent verification

If properly implemented, electronic systems such as I-RECs and TIGR Registry provide greater transparency and accountability in tracking, transferring, and cancelling RECs. Where contracts are used, claims should be based on the ownership of the attributes stipulated in the contract. Both TIGRs and I-RECs use third parties to support the review and approval of generation data – I-RECs refers to the third party as an "Issuer," and TIGRs references a "Qualified Reporting Entity." As shown in Table 5: Comparison of I-RECs and TIGR, both registrars mandate that the third party must verify generation to register MWh in the system via an independent report or meter reading. Third-party verification provides assurance that RECs were not double counted and that non-energy benefits are included. Double counting

[13] https://buyersprinciples.org/principles/

occurs if RECs are used in both the voluntary market and to meet an RPS, or by two parties in the voluntary market. Double counting is a concern because if two parties each claim to be using the same RE represented by a REC, it undermines the credibility of RECs as a certification of RE use. The role of REC tracking systems is discussed in Section 2.1.2.

4.2.4 Ongoing monitoring to ensure ongoing compliance

A key focus of the international tracking registries is ongoing maintenance and monitoring to ensure operational quality and integrity. I-REC and TIGR are consistently evaluating and verifying mechanism operations, performing in house and independent verification in areas, such as:

- Assessing Issuers for accreditation;
- Performing periodic systems audits of Issuers;
- Conducting initial and periodic review of Production Device registrars;
- Performing independent validation of production data;
- Registry monitoring;
- Conducting independent assessment of change proposals; and
- Liaising with other tracking systems and national and international anti-fraud and money laundering authorities

These activities are key to detecting fraud and protecting the operational effectiveness and integrity of the REC tracking systems.

W1.2 Review of current institutional and legal framework related to RECs in Vietnam

W1.2 of this Report will support of the introduction of a successful RECs policy in Vietnam, VLEEP by assessing the current legal, regulatory, and institutional framework related to RECs in Vietnam.

Part II of this report consists of the following sections:

- **Section 5** reviews the existing legal, regulatory, and institutional framework for RECs in Vietnam
- **Section 6** reviews the current practices for GHG reduction certificates in Vietnam
- **Section 7** analyzes the gaps, barriers, and risks with reference to international leading practices

5. Review of the existing legal, regulatory, and institutional framework for RECs in Vietnam

5.1 Overview of climate change/green growth policies, laws, and regulations in Vietnam, with regard to energy sector and NDC implementation

GVN recognizes the myriad benefits increased RE development offers, including improved energy security, reduced reliance on fossil sources, reduced fossil fuel-based emissions, increased energy access and rural electrification, and more. Over the past decade, GVN has initiated numerous climate change and green growth policies, laws, and regulations, as summarized in Table 8 below.

Table 8: Climate Change / Green Growth Policies in Vietnam

Ref.	Policy	Implementation Date	Relevance to energy sector and NDC
1	**Decision No. 158/2008/QD-TTg National Target Programme on Response to Climate Change**	02/12/2008	Sets out a range of activities to move towards a low-carbon economy, such as:[14] • Designates MOIT as responsible for energy sector and MONRE is responsible for NDC • Elaborates ministry and branch action plans to respond to climate change. Such plans shall be worked out step by step in a certain order to ensure their quality, feasibility, and implementation effectiveness. • Sets climate change targets through 2015 • Requires Ministries and branches to periodically report to GVN
2	**Law on Economical and Efficient Use of Energy**	17/06/2010	Outlines measures for efficient use of energy and promotion of renewables with incentives, labels, etc.

[14] III.8 of Article 1

Ref.	Policy	Implementation Date	Relevance to energy sector and NDC
3	**Guidelines on implementation of Decision 130 related to Clean Development Mechanism (CDM) projects**	15/12/2010	Allows RE projects to be considered CDM projects; Outlines benefits associated with RE projects, such as: preferential tax treatment, land use, land rent, quick depreciation of fixed assets, investment credit from GVN, etc.; Declares that RE projects are eligible for corporate tax exemption (detailed at Annex 1 of the Decree 108/2006-ND-CP)
4	**Decision 1208/QD-TTG National Master Plan for Power Development for the 2011-2020 Period with the Vision to 2030**	21/07/2011	Determines that energy prices shall reflect marginal costs; Details tax incentives for RE projects
5	**Environmental Protection Tax Law**	01/01/2012	Creates possibility for environmental taxes and potential for carbon tax
6	**PM Decision No. 2139/ QD-TTg Vietnam's National Climate Change Strategy**	05/12/2011	Outlines objectives of GVN's low-carbon economy; Clearly sets RE targets as a solution for tackling climate change, such as:[15] • By 2020, total capacity of hydropower plants will reach 20,000-22,000 MW • Stepping up research and development of technologies to generate renewable and new energies, including wind, solar, tide, geothermal, bio and cosmic energies • Formulating and implementing policies to involve various social and economic entities in the promotion of RE use • Assuring national energy security in the direction of coordinated development of all energy sources • Increasing the share of new and renewable energy to about 5 percent of the total commercial primary energies by 2020 and about 11 percent by 2050
7	**Decision 1393/QD-TTg National Green Growth Strategy**	25/09/2012	Sets GHG reduction targets; Introduces Nationally Appropriate Mitigation Actions (NAMAs); Outlines MRV system; Defines and emphasizes electricity generation from RE resources as a means for reducing GHG emission
8	**Decision 1775 Approval of Project of Greenhouse Gas Emission Management; Management of Carbon Credit**	21/12/2012	Sets GHG reduction targets; Outlines NAMAs; Addresses measurement, reporting and verification (MRV) system.

15 Section IV.5a: Development of new and renewable energies

Ref.	Policy	Implementation Date	Relevance to energy sector and NDC
	Business Activities to the World Market		
9	**Action Plan for Banking Sector**	6/8/2015	The State Bank of Vietnam defines RE projects as a green sector to be promoted and eligible for green credits from local commercial banks thereby increasing funding opportunities for RE projects
10	**Action Plan for Green Growth**	20/10/2015	Outlines how green bonds can be used as an alternative debt solution to RE project investors as well as provinces and cities to promote RE investment; RE projects are defined as a green sector to be eligible for green financing
11	**Decision on Approval of Renewable Energy Development Strategy (REDS) to 2030 with Vision to 2050**	15/11/2015	Defines development orientation of RE with ambitious targets; Mandates that RE resource assessments should be conducted and planned; Determines that technical standards of RE project should be studied and promulgated Perhaps the most relevant topic of REDS policy to the REC market is that it mandates that Vietnam implement a renewable portfolio standard (RPS) in 2020. REDS identifies the entities with obligations under the RPS as well as their obligations under the RPS. However, it does not specify the accounting instrument that will be used to ensure compliance and enforce the RPS.
12	**Decision on Approval of Power Development Plan 7 revised**	18/3/2016	Declares that RE will be an integral part of the national power system; Clearly sets targets for RE in general and by source; Outlines power tariff projections, meaning that RE power can compete with power from coal and hydro
13	**Decree on State Investment Credit**	31/3/2017	Defines RE projects as preferential investments
14	**Decision on Amendment Mechanism for Retail Power Price Structure**	30/6/2017	Declares that RE price will be embedded into the calculation of power tariffs by EVN to compensate for FIT and avoided cost tariff support
15	**Circular 34/2019/TT-BCT**	28/11/2019	Regulates the energy information system; Provides for the establishment, management, and operation of energy information systems as well as the organization, construction, and exploitation of energy database
16	**Law on Environmental Protection**	17/11/2020	Regulates the development of domestic GHG inventory and domestic carbon market: allocating GHG emission quotas; organizing operation of the domestic carbon market and participating in international carbon markets and identifies MONRE as the lead ministry tasked with overseeing the inventory and market.

In December 2008 the government adopted a *National Target Programme on Response to Climate Change* which sets out a range of activities to help the country adapt to the impacts

of climate change and move towards a low-carbon economy. In June 2010, the National Assembly passed the *Law on Economical and Efficient Use of Energy.* This law established the policies to use energy economically and efficiently; encouraged the use of energy-saving devices and equipment; implemented an energy labelling roadmap; and raised the renewable energy use rates. It included market-based instruments (MBIs), such as: energy price subsidies and incentives as well as information instruments, including labels. Later in 2010, GVN introduced *Guidelines on Implementation of Decision 130 related to Clean Development Mechanism (CDM) projects,* which enabled RE projects to be considered CDM projects and as such could benefit from preferential tax treatment, quick depreciation of fixed assets, as well as investment credits from the Government.[16] The Guidelines specifically outlined CDM credit owners as follows:

- **If the owner is a foreign investor**: When selling or transferring certified emissions reduction CERs to their countries, foreign investor CERs owners must report this information to MONRE and Vietnam Environmental Protection Fund. Investors must fully pay CERs sale fees within 15 working days after transferring CERs to buyers or to their countries.
- **For Official Development Assistance (ODA)-funded projects**: For ODA-funded CDM projects, collected CERs shall be managed and used as follows:
    a) For CDM projects with ODA funds wholly allocated from the state budget, collected CERs will be owned by the State. Project investors shall sell CERs and remit all CERs sales into the Vietnam Environmental Protection Fund after subtracting sale expenses (if any);
    b) For CDM projects with ODA funds borrowed from domestic credit institutions or directly from the Ministry of Finance (MOF) or on-lending agencies authorized by the MOF, collected CERs will be owned by investors;
    c) For CDM projects with both state budget-allocated ODA funds and funds raised by enterprises themselves or ODA funds borrowed from commercial banks or directly from the MOF or on-lending agencies authorized by the MOF, CERs collected from CDM projects shall be divided to the State and investors in proportion to funds allocated from the state budget and other funds for investment in CDM projects. CERs divided in proportion to ODA funds allocated from the state budget will be owned by the State. Project investors shall sell CERs and remit all sales from CERs owned by the State into the Vietnam Environmental Protection Fund after subtracting sale expenses (if any)

The *Environmental Protection Tax Law,* which took effect on January 1, 2012, outlines taxable subjects amongst other liquid fuels except biofuels and coal. Tax rates are specified in absolute terms in the tariff table of the law with the notion that the tax rate shall be in line with socio-economic development policy and the extent of negative environmental impact caused. The law also introduces the concept of an environmental tax, which could be important in the future as an instrument to reduce GHG emissions (e.g. in the form of a carbon tax).

Decision 1208/QD-TTG National Master Plan for Power Development for the 2011-2020 Period with the Vision to 2030 (Master Plan 7) prioritizes the development of renewable energy sources for electricity production. The plan aims to increase the RE share and reduce the elasticity coefficient electricity to GDP. It also outlines that the State shall provide tax incentives and related benefits to RE projects and for urban waste to generate electricity. In 2016, *Master Plan 7 Revised* was approved, regulating RE as an integral part of the national

[16] Joint Circular No. 204/2010/TTLT-BTC-BTN&MT on amending and supplementing some provisions of Joint Circular No. 58/2008/TTLT-BTC-BTN&MT

power system. PDP7-R sets clear targets for RE in general and by source. Note these are different targets than those outlined in the Renewable Energy Development Strategy (REDS) (see Section 8.1.2).

Vietnam's National Climate Change Strategy, promulgated as part of Prime Minister's Decision No. 2139/QD-TTg in December 2011, outlines climate change adaptation as an initial priority of Vietnam's climate change strategy. The strategy also outlines specific objectives, including that a low-carbon economy and green growth will become primary trends in Vietnam's sustainable development.

GVN set its objectives to achieve a low carbon economy and to enrich natural capital in its *National Green Growth Strategy* adopted in 2012 (Decision 1393/QD-TTg). The strategy considers reduction of GHG emissions and increased capability to absorb GHGs as important indicators in socio-economic development. It sets the strategic objective to reduce the intensity of GHG emissions and promote the use of clean and RE. The strategy set the following core targets through 2030:

- Reduce annual GHG emissions by at least 1.5-2%[17]
- Reduce GHG emissions in energy activities by 20-30% compared to business as usual.[18] Of this commitment, the voluntary reduction will be approximately 20%, and a 10% is dependent on additional international support.

In November 2012 Vietnam approved *Decision 1775 Project of GHG Emission Management* to: (1) manage GHG emissions necessary for implementing UNFCCC and other international agreements; (2) take advantage of the opportunity to develop a low carbon economy together with the international community; and (3) contribute to the country's sustainable development. The Decision sets targets to prepare the framework to register and widely deploy Nationally Appropriate Mitigation Actions (NAMAs) to prioritize the efficient use of energy and energy conservation. The Decision also outlines the setup of a system of measurement, reporting and verification (MRV) at the national and sectoral levels to aid in the inventory and management of GHG emissions, including the development of emission coefficients for the country.

The *Renewable Energy Development Strategy to 2030 with vision to 2050 (REDS),* implemented in November 2015, clearly defines the development orientation of RE and sets ambitious RE targets. The Decision mandates that RE resource assessments be conducted and that technical standards of RE project should be studied and promulgated.

Over the past decade, GVN has begun implementing electricity market reforms to encourage private sector investment in the power sector and to remove investment barriers. The first step in developing a competitive electricity market involved the introduction of the *Vietnam Competitive Generation Market* (VCGM) in 2012. Under this regime, most RE generation facilities were classified as indirect trading generators and were exempt from trading directly in the market. EVN retained its purchase right as the single-buyer and all power sales were negotiated through the Electric Power Trading Corporation, a subsidiary of EVN, which also acted as a broker under this market scheme. The next phase of market liberalization, VWEM launched its pilot operations in 2016. The VWEM design classifies all RE generators above 30 MW as direct generators to trade in the market and opens up the market to multiple buyers and sellers. Accordingly, RE developers will be allowed to sell their electricity either to the

[17] As formulated in the Decision this would be an absolute reduction target. However it is assumed that the target is an intensity target as emissions per GDP.

[18] The Decision does not state which is the BAU case. A possible BAU scenario is the one as realized by MPI under BAU-max (MPI is also the focal point on the implementation of the green growth strategy). The 2nd National Communication of Vietnam had e.g. for the year 2020 a BAU scenario of 251 $MtCO_2$ i.e. 29% less than the MPI BAU-max scenario.

EVN or regional EVN PCs acting as electricity distributors, depending on type of RE used. In general, with the exception of small hydro projects, RE procurement mechanisms have yet to be effective in deploying RE-based power sources. As of 2015, the total cumulative installed capacity of small hydropower plants was still only 2,200 MW. However, piloting VWEM has the potential to open up new opportunities for RE project developers to sign bilateral contracts with EVN PCs.

Among the most relevant aspects of the REDS policy to Vietnam's REC market is that it establishes a renewable portfolio standard (RPS) set to be put in force in post-2020. REDS identify the entities with obligations under the RPS as well as their obligations under the RPS. However, it does not specify the accounting instrument that will be used to ensure compliance and enforce the RPS. Further policy work will be required to address the gap between RPS targets and the definition of RECs as compliance instruments to support enforcement of the policy.

The 2015 *Action Plan for Green Growth* outlines how green bonds can be used as an alternative debt solution to RE project investors and for provinces and cities to promote RE investment. In the State Bank's 2015 *Action Plan for Banking Sector,* RE projects are clearly defined as a green sector to be promoted and eligible for green credits from local commercial banks. Similarly, MPI's 2017 *Decree on State Investment Credit* defines RE projects as preferential investments. These action plans and decrees enhance investment opportunities for RE projects.

Procurement of RE is currently carried out via three mechanisms in Vietnam: FiTs, avoided cost tariffs (ACTs), and standardized power purchase agreements (SPPAs). The *Decision on Amendment Mechanism for Retail Power Price Structure* (2017) embeds RE price into EVN's calculation of power tariff to compensate for FiT and ACT support.

- ***FiT*** are being applied to nearly all RE sources. The appropriate FIT price is awarded to a grid connected RE project if approved by local authorities without a competitive bidding selection process. Wind electricity is sold to the national grid at 7.8 USD cents/kWh. Biomass-based electricity (CHP technology) is sold at 5.8 USD cents/kWh. Solid waste-fired electricity is sold at 10.05 USD cents/kWh. Landfill gas-fired electricity is sold at 7.28 USD cents/kWh.
- ***ACT*** have been used to procure RE generated by small hydro power projects with capacity less than or equal to 30 MW, cascade hydro power plants with a total capacity less than 60 MW, and biomass-based power projects (only electricity generation). However, ACT does not apply to biomass power plants using CHP technology and bagasse-based extraction condensing power generation projects for sugar mills. For off-grid biomass-based power projects, investors develop electricity price proposals and submit these to MOIT for appraisal. MOIT then reports proposals to the Prime Minister for approval. Any subsidies are provided by the Vietnam Environmental Protection Fund.
- ***SPPAs*** were first introduced in 2008 to procure RE generated by the grid (i.e. connected small hydro power projects with capacity less than or equal to 30 MW). Initial small hydro power projects were awarded 20-year SPPA contracts with EVN. This resulted in the rapid development of small hydro power projects from 2008 to 2012. SPPAs have recently been re-introduced to procure other grid-connected RE sources including wind, biomass-to-energy, waste-to-energy, and landfill gas-to-electricity. The use of the SPPAs allows investors and developers to come to long-term contract agreements with EVN and the associated Power Companies.

The organization, construction and exploitation of energy database were also regulated in the MOIT Circular 34/2019/TT-BCT regulated the establishment, management and operation of

energy information systems. However, how this energy database can be used for REC tracking systems has not yet been defined.

Most recently, the development of domestic carbon market is regulated on the *Amended Law on Environmental Protection (Law 72/2020/QH)*. The road map includes allocating GHG emission quotas, organizing operation of the domestic carbon market and participating in international carbon markets, and emphasizes the need to create market instruments that simplify the procurement of environmentally sustainable products and services.

- **Article 91: Reduction of GHG emissions**
    - *Clause 2. Related to the carbon market, the reduction of GHG emissions shall focus on:*
        - *d) formulating and implementing the mechanism and method for cooperation in reduction of GHG emissions in accordance with regulations of law and international treaties to which Vietnam is a signatory;*
        - *dd) organizing and developing the domestic carbon market.*
- **Article 91: Reduction of GHG emissions**
    - *Clause 5. A Ministry that manages sectors subject to GHG inventory has the responsibility to:*
        - *b) formulate and organize implementation of the annual plan to reduce GHG emissions in the fields of energy, agriculture, land use, forestry, waste management and industrial processes;*
        - *c) provide guidance on technical processes and regulations regarding measurement,*
        - *d) annually consolidate and report results of reduction of GHG emissions within its scope of management to the MONRE before January 15 of the next reporting period for consolidation and reporting to the Prime Minister.*
- **Article 139: Organizing and developing domestic carbon market**
    - Clause 1. *The domestic carbon market covers the exchange of GHG emission quotas and carbon credits obtained from the participation in domestic and international carbon credit exchange and offsetting mechanisms in accordance with regulations of law and international treaties to which Vietnam is a signatory;*
    - Clause 2. *GHG-emitting facilities that are required to conduct an inventory of GHGs are given GHG emission quotas and reserves the right to exchange and trade quotas on the domestic carbon market;*
    - Clause 10. *The MONRE shall organize allocation of GHG emission quotas to the entities; organize operation of the domestic C market and participation in international C markets;*
    - Clause 11. *The Government shall elaborate this Article and costs of allocating GHG emission quotas, roadmap, and time for operating the domestic C market in conformity with national socio-economic conditions and international treaties to which Vietnam is a signatory.*
- **Articles 144, 145, 147, 153, and 156: Green labels, environmental services, and human resource development.**

- Highlights the need for additional environmental services, service providers, and training (specifically for government stakeholders) on the provision of environmental services and GHG accounting systems.
- Identifies need to align domestic eco-labels and certification systems with international best practices and rating schemes.

5.2 Institutional framework for carbon tracking/management: national MRV system, sector MRV systems, NDC/BUR reporting

Over the past decade, GVN has made efforts to improve the monitoring and management of GHG emissions in the country and to further the development of carbon assets for the international carbon market, in line with the objectives set out in the *Plan to Manage GHG Emissions and Establish a Carbon Trading Scheme19 (2012)*. The goal of this is to broaden coverage of MBIs, ideally to achieve a comprehensive carbon pricing scheme and integration with the international market. Under the plan, a national system to control GHG will to be set up with the participation of relevant ministries and branches. Implementation schedule was divided by 2 period: i) before 2016; and ii) 2016-2020.

5.2.1 Partnership for Market Readiness (PMR)

Vietnam has used the Partnership for Market Readiness (PMR) to advance the goals of its National Strategy on Climate Change and the Vietnam Green Growth Strategy. PMR is a grant-based, capacity building trust fund that provides funding and technical assistance for the collective innovation and piloting of market-based instruments for GHG emissions reduction.

The Partnership has adopted a phased approach to the development of market readiness: (1) preparation of an Expression of Interest; (2) supported development of an Organizing Framework detailing the institutional structure and the proposed actions to be undertaken; (3) preparation of the Market Readiness Proposal (MRP) containing concrete proposals for the disbursement of funds in anticipation of implementation of market-based instruments; and (4) implementation. The MRP details the country road map for designing, piloting, and implementing proposed MBIs, the institutional or regulatory components needed for capacity building and building market readiness, as well as a funding estimate for implementation. Following PMR Assembly acceptance of the MRP, implementation funding will directly support the development, design, and eventual implementation of market readiness activities that are aligned with its climate change, sustainable development, and economic growth objectives.

Vietnam presented its organizing framework for PMR implementation to the Partnership Assembly in Cologne 2012. As key drivers of climate change issues within GVN, the Ministry of Planning and Investment (MPI) and the Ministry of Natural Resources and Environment (MONRE) have been appointed as Vietnamese Focal Points. The Department for Science, Education, Natural Resources and Environment (DSENRE), under MPI, and the International Cooperation Department (ICD), under MONRE, form the preparation unit within the leading ministries. The PMR Steering Committee is composed of a variety of ministries involved in climate change in Vietnam, including MPI, MONRE, MOF, MOIT, Ministry of Construction (MOC), and Ministry of Transport (MOT). The PMR Organizing framework has two phases:

- Phase 1: 2013-2018 Establish legal frameworks and a pilot market-based instruments in selected sectors/regions
  - Study and propose the required legal framework to implement selected MBIs;
  - Set up Institutions required to ensure the success of pilot MBIs;

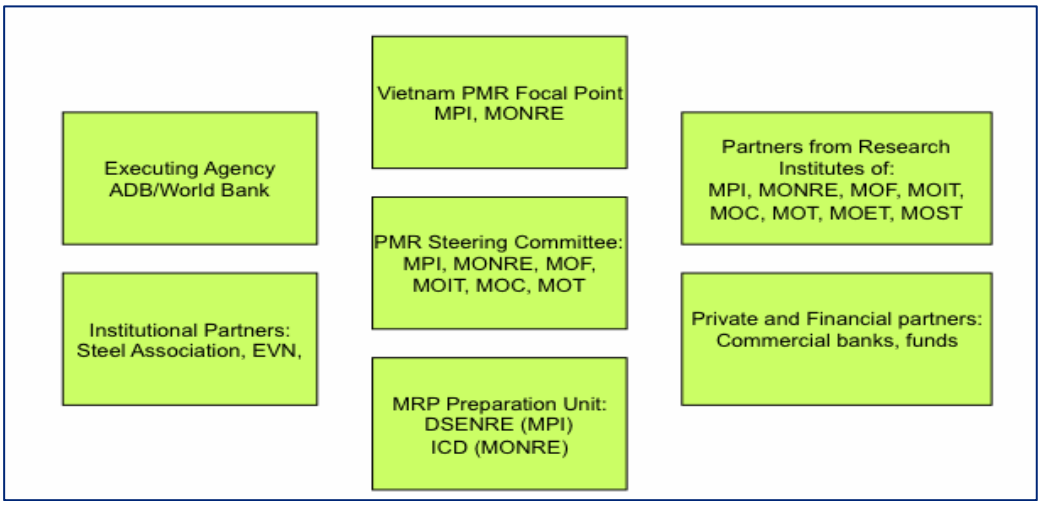
[19] Decision No. 1775/QĐ-TTg on approval of project of greenhouse gas emission management; management of carbon credit business activities to the world market

- Creation and testing of institutional, technical, and regulatory instruments and feedback for further refinement of MBIs.

- Phase 2: 2018-2020 Establishment of a domestic carbon market instrument and connection to international market
  - Broaden coverage of MBIs, ideally to achieve a comprehensive carbon pricing scheme;
  - Integration with the international market.

Figure 5 displays the full GVN organization for Vietnam's PMR application.

Figure 5. GVN Organizational Setup for Preparing the Market Readiness Proposal



Source: Presentation of the "Organizing Framework for Scoping of PMR Activities", May 11, 2012

In December 2020, the PMR published two reports that examine the potential application of market-based instruments (MBIs) and carbon pricing instruments (CPIs) to support Vietnam in reducing its GHG emissions and meeting commitments under its NDCs. RECs feature prominently in these reports, specifically as they relate to compliance regimes (i.e. Vietnam's RPS). Salient points and recommendations from the PMR Task 1 and Task 2 Reports as they pertain to the Vietnamese REC market are listed below to support alignment between the present study and materials prepared under the PMR.

- CPI case study table in Report #1 (p. 17-20);
- CPIs must be implemented in phases to maximize impact;
- Capacity building will be key for any CPI to be introduced;
- Summary of lessons learned from case studies worldwide (Report #1 p. 21-23);
- Green Certificate consistency with existing policies; and
- The GCS section in Report #2 (p. 157-171) which outlined gaps and mitigation measures for policy/legislative, institutional, and technical issues.

Ministry of Planning and Investment (MPI): MPI is responsible for state management over planning and investment. MPI directs the implementation of climate change in the socio-economic national and provincial strategies and programs. In this function, MPI developed the Green Growth Strategy of Vietnam. MPI coordinates with other ministries as well as the People's Committees of provinces and cities and to evaluate and review the implementation of the strategies, providing periodic reports to the Prime Minister. MPI cooperates closely with MONRE in mobilizing international donors for climate change activities and collaborates with the MOF in advising the PM in budget allocation for the activities in this sector.

Ministry of Natural Resources and Environment (MONRE): In 2008, MONRE was designated as the lead agency to facilitate the National Climate Change Strategy. It is responsible for climate change related policies, developing guidelines, and designing response mechanisms. Moreover, MONRE has responsibilities concerning the implementation of policies, the supervision of their progress, and in the formulation of MRV frameworks. The GHG inventory is established under MONRE's oversight. Within MONRE, the ***Department of Climate Change*** (DCC)[20] is the ***Designated National Authority*** (DNA) of Vietnam. The DNA is a position outlined in the Kyoto Protocol responsible for establishing efficient and transparent national CDM project approval procedures for the evaluation and certification of projects. As the DNA, the DCC is the focal point for the CDM and for NAMAs. It supports GVN in the formulation and management of carbon offset trading in the international context.

Ministry of Finance (MOF): Together with MONRE, MOF is responsible for the mobilization and allocation of budget for climate change programs and projects. MOF leads the review and monitoring of budget usage for these activities. The Green Growth Strategy outlines MOF's primary functions to "develop policies to encourage all economic sectors, organizations and individuals to invest in development of the green economy in Vietnam".

Ministry of Industry and Trade (MOIT): The primary function of MOIT is the state management of industry and trade. Important energy and industrial sectors, such as electric power, oil and gas, industrial mining, mineral processing, and chemical industry, also fall under MOIT. The ministry is responsible for new energies, RE, and the development of plans and programs for energy savings and energy efficiency. The *Decision on the "National Program on Energy Efficiency and Conservation in the period 2019 – 2030"* (Ref: 280/QD-TTg, March 2019) is to be implemented by MOIT. The Decision sets a national target to achieve five to eight percent savings of the total energy consumption in 2019 - 2030 compared to forecasted energy demand in the national electricity development plan. MOIT is the active counterpart for all Nationally Appropriate Mitigation Action (NAMA) projects in the industrial or energy sectors.

Established in 2017, the ***Electricity and Renewable Energy Authority (EREA)***[21] performs the function of advising and assisting the Minister of Industry and Trade in state management and implementation of state management tasks in the fields of electricity, energy and renewable energy. EREA takes the leading roles in promoting new and renewable energy through different incentives programs e.g. feed-in tariffs (FiT) for wind and solar as well as the Rooftop Solar Promotion Programme.[22]

Starting from 2017, the ***Department of Energy Efficiency and Sustanable Development (EESD)***[23] takes the role of responsible body for climate change and green growth in MOIT. EESD works closely with DCC to establish the national GHG Inventory, and is the implementing agency in the NAMA projects. EESD is also the agency in charge of the national energy efficiency program.

Ministry of Science and Technology (MOST): MOST is responsible for state management of science and technology, including science and technology activities; development of science and technology potential; intellectual property; standards, metrology and quality control; atomic energy, radiation and nuclear safety; and management of public services in fields under its purview. In the field of climate change, MOST and its research institutes are responsible for researching and evaluating new technologies and for monitoring facilities for

[20] Established by MONRE's Decision No. 1266/QĐ-BTNMT dated May 25, 2017, based on the foundation of Department of Meteology, Hydrology and Climate Change (DMHCC)
[21] By MOIT's Decision No. 3816/QD-BCT dated October 2, 2017
[22] By MOIT's Decision No. 2023/QD-BCT dated July 5, 2019, and launched on July 25, 2019
[23] By MOIT's Decision No. 3772/QĐ-BCT dated October 2, 2017

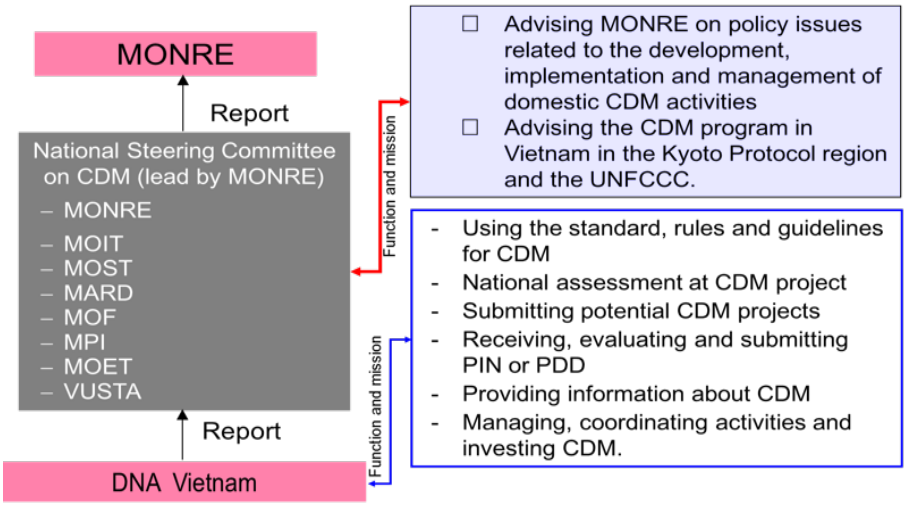
adaptation of climate change impacts. MOST organizes and plans research activities in Vietnam and supports other line ministries with know-how and integration of green technology.

5.2.2 Clean Development Mechanism (CDM) and Nationally Appropriate Mitigation Actions (NAMA)

Vietnam intended to initially apply market-based instruments to selected sectors with the goal of broadening the scope and achieving broad-based carbon pricing over time. The policy framework includes domestic instruments as well as international carbon finance instruments. The country has considerable albeit recent experience in the CDM market and has embarked strongly on the preparation of NAMAs in various fields including waste, steel, and iron as well as the building sector.

CDM is a special mechanism related to developing countries and is one of the most important outcomes of the Kyoto Protocol (1997). The mechanism enables projects to reduce GHG emissions or increase GHG tanks, support sustainable development in developing countries (countries that do not have any commitment to cut emissions), and collect certified emission reductions for project owners. To join the mechanism, each country must setup a national authority (DNA) on CDM. In 2003, GVN assigned the National Office for Climate Change and ozone Layer Protection (NOCCOP) under ICD as the Domestic Lead Agency for CDM and established the National Advisory and Executive Committee on CDM.[24] The Committee consists of 12 representatives from MONRE, MPI, MOST, MOF, MOIT, MOET, Ministry of Foreign Affairs, Ministry of Agriculture and Rural Development, and Union of Vietnam Science and Technology Associations. Figure 6 shows the organizational model of CDM Vietnam. As a CDM project, RE projects in Vietnam can benefit from preferential tax treatment, enhanced land use, quick depreciation of fixed assets, and investment credits from GVN.

Figure 6. Organizational Model of CDM Vietnam



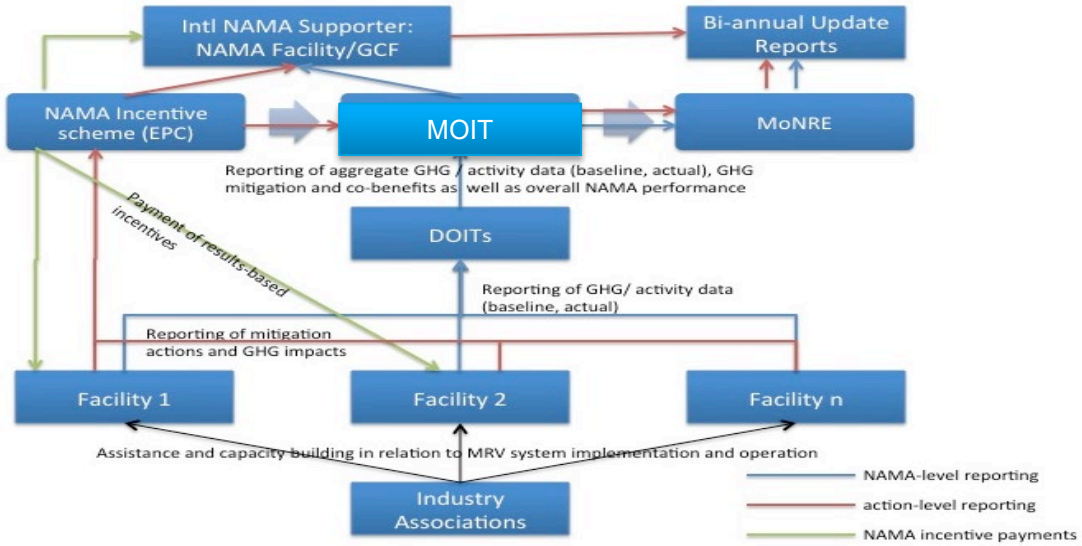
As mentioned above, the Project of GHG Emission Management, approved in November 2012, set specific targets for (i) preparing the framework to register and widely deploy NAMAs amongst the energy sector, (ii) the efficient use of energy and energy conservation, and (iii) establishing a MRV system. Unlike CDM requirements, the international climate policy process does not impose mandatory requirements on the design of NAMA MRV frameworks. Instead, countries are invited to make suggestions via their NAMA proposals.

[24] Based on Decree No. 553 of April 29, 2003 of the Ministry of Natural Resources and Environment

Given that DCC (formerly *Department of Meteorology, Hydrology and Climate Change, "DMHCC"*) acts as DNA within the UNFCCC scheme, it is familiar with global carbon market issues and climate change policy and knows, based on CDM experiences, the strict MRV systems concerning carbon credits. Under the 2012 Decision 1775 Approval of Project of Greenhouse Gas Emission Management; Management of Carbon Credit Business Activities to the World Market, MONRE was assigned as the responsible ministry and DHMCC was appointed as focal point for "forming the domestic carbon market and participating in the international carbon market."[25] As a result, DMHCC is responsible for setting up a database on national GHGs and establishing a national GHG inventory as well as a system for national GHG inventories. At the same time, DMHCC was appointed to build up the NAMA framework in Vietnam and build the associated national and sectoral-level MRV system. MPI and MONRE selected DMHCCC as the implementing agency for the third phase of the PMR based on the strong integration of DMHCC in carbon markets, NAMAs, and the MRV system, including national GHG inventories.

Since 2012, MONRE has received support from GIZ to establish a NAMA framework, implement a sector based MRV system, and develop two bankable NAMA proposals. Figure 7 shows a concept of incentive flows within a possible NAMA structure for industrial entities. Entities would report their activities, associated energy use, and GHG intensity data annually to a local or central system that provides access to both Departments of Industry and Trade and MOIT on the basis of one standard user data interface. The system would integrate all energy and GHG related facility-level reporting requirements and would contain a quality and plausibility verification system to flag data input errors in real-time. The interface would be designed on the basis of stakeholder input (reporting entities) as well as MOIT requirements and requirements of other regulators that currently receive energy audit related data.

Figure 7. Illustrative data and incentive flow within a possible NAMA Structure



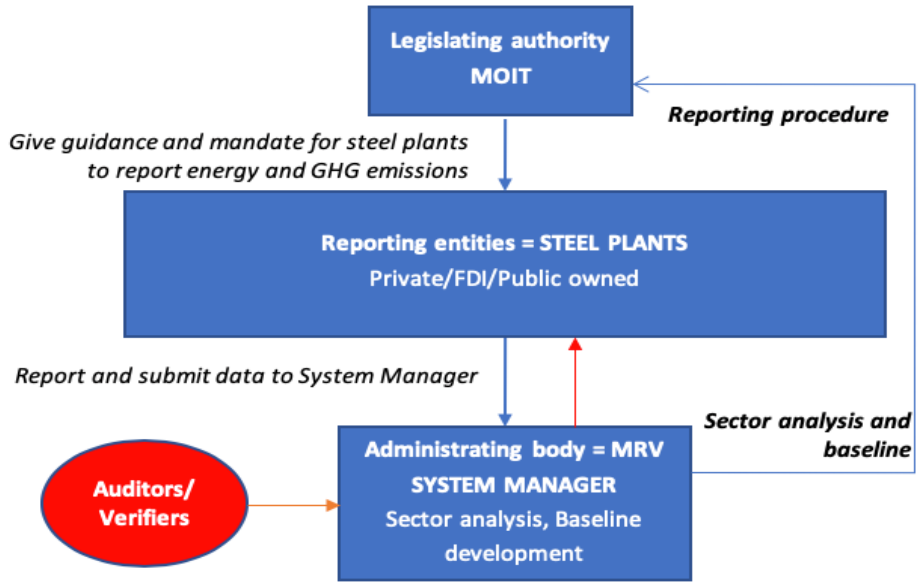
Recently, the WB-funded VNPMR project conducted a pilot for introducing C pricing instruments and developing a roadmap for the application of MBIs in the steel sector.[26] It is proposed to establish a '**System Manager'** function for the management of the VN-MRV(S). The System Manager will receive submissions from sites and prepare sector level reports. Sector reporting will include aggregated GHG emissions for the sector, the distribution of GHG

[25] Decision 1269/QD-BTNMT, July 31, 2013
[26] NIRAS, Final Task 1 Report: Development of the Readiness for the sectoral crediting program in VN Steel sector. Dec 2020

intensities across the sector (per ton of steel production), trends over time, and the breakdown of emissions from the different emission sources (fuels, energy carriers and materials), for different emission scopes (Scope 1, 2, 3), and for the main types of steel plant (BF or EAF based).

Figure 8 shows a concept of incentive flows, in which the role of System Manager would logically rest with the government, presumably MOIT. An appropriate level of participation by the Vietnamese Steel Association is recommended as part of a steering committee. Submission of the plant level data, and ensuring its integrity, will be the responsibility of the company operating the plant, subject to the agreed verification and audit procedures.

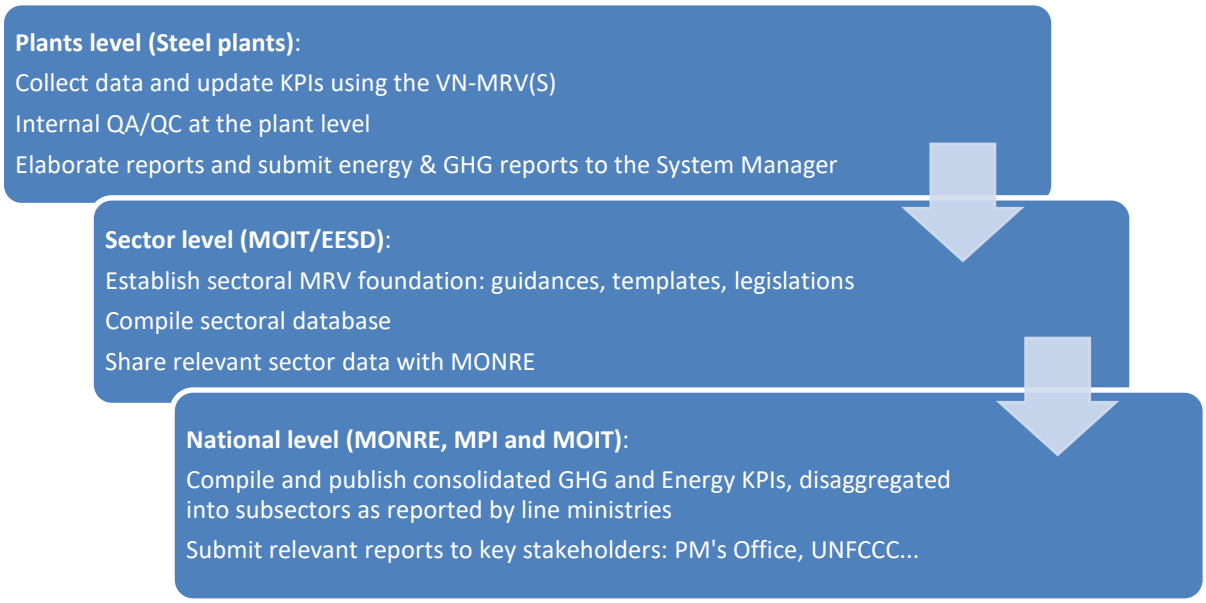
Figure 8. Proposal of reporting schedule



In Vietnam, MONRE/DCC is the focal point unit for the NDC, the National Inventory system, specifically is responsible for national reporting obligations, including periodic GHG inventories to the UNFCCC. But within the country, different ministries manage different industry sectors. The shows the proposed MRV coordination at three levels[27]. It is recommended that reporting entities should submit their GHG/Energy reports directly to the appropriate ministries for their sectors. Then individual ministries compile and submit GHG reports to MONRE.

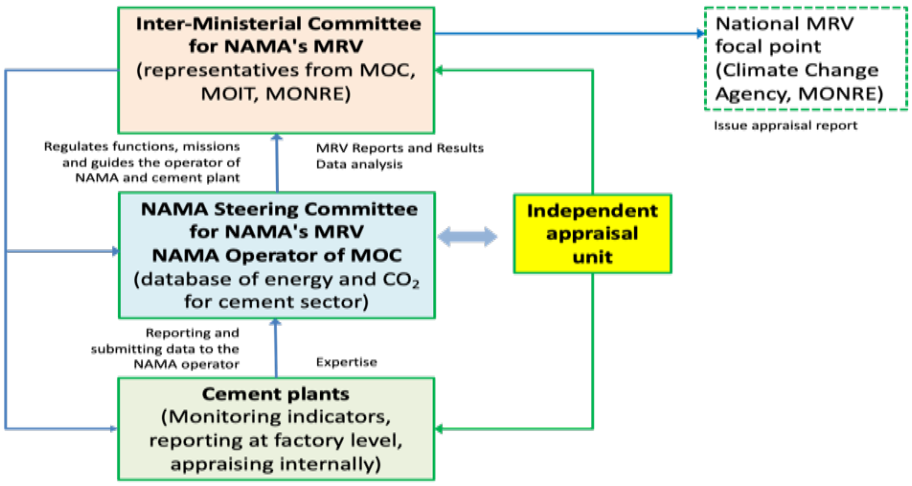
[27] NIRAS, Final Task 1 Report: Development of the Readiness for the sectoral crediting program in VN Steel sector. Dec 2020

Figure 9. Proposed MRV coordination process at three levels



Besides the steel industry, cement production and urban domestic solid waste management are also potential sectors for NAMAs. Figure 10 presents the sector-level MRV system that has been proposed for cement sector.

Figure 10. Proposed MRV system for NAMAs in cement sector[28]



5.2.3 Energy information systems of Vietnam

Circular 34/2019/TT-BCT (November 2019) mandates the establishment, management, and operation of an energy information system under the purview of MOIT. The system collects and information on:

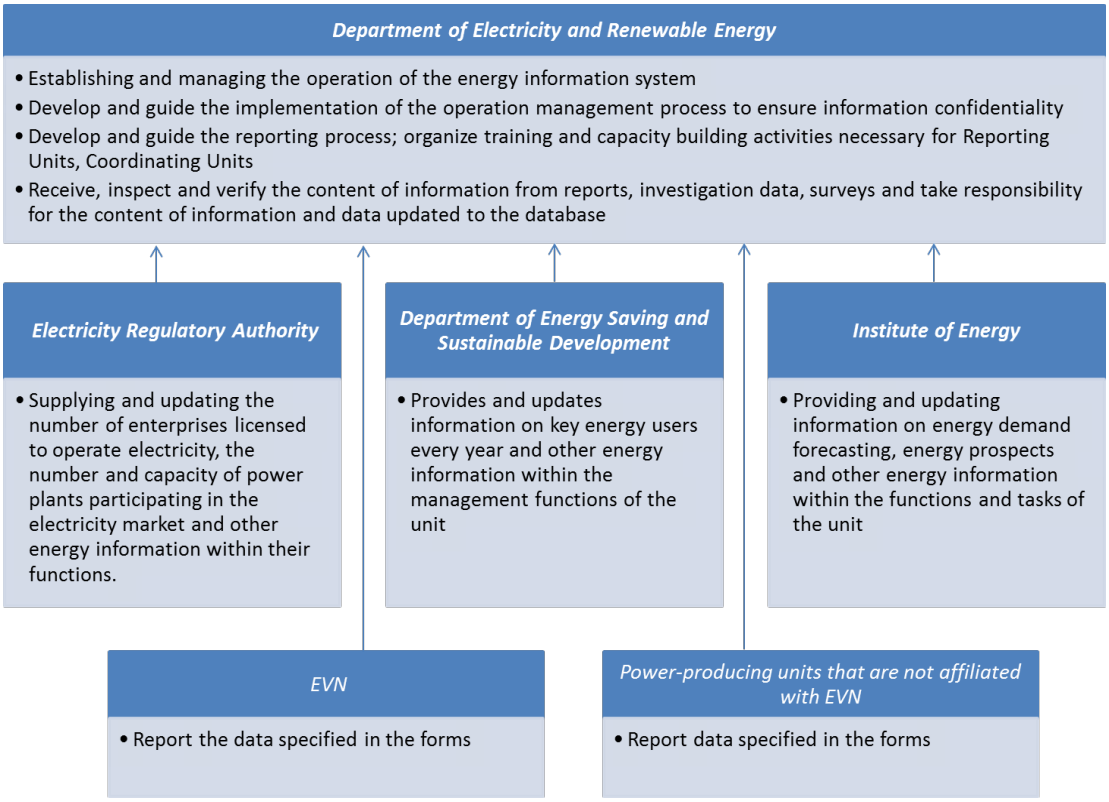
- Energy supply-demand balance;
- Specifications of energy infrastructure;
- Average annual energy prices; and

[28] Nguyen Hong Loan. Development of a MRV system that meets the requirements of the UNFCCC and supports the implementation of C pricing tools. Workshop: Developing the C market in Vietnam. Phu Tho, Vietnam. Oct. 2020.

- Other statistical standards.

Energy internationalization falls under the responsibility of the MOIT. Figure 11 shows the responsibilities of the agencies under MOIT.

Figure 11. Responsibilities of the agencies in the energy information system of Vietnam



5.2.4 Stakeholder mapping for carbon management and clean energy certification

Energy information is published on the website of the energy information system at www.veis.erea.gov.vn. Energy information is provided and used in the following groups: i) Publicly shared with the community; ii) Providing according to obligations and responsibilities in agreements between Vietnam and international organizations; iii) Supply at the request of relevant organizations and individuals for state management purposes as prescribed by law.

Key GVN stakeholders in the energy sector

The Vietnamese electricity industry is currently managed directly by MOIT, a specialized ministry responsible for building and managing energy development policies, including renewable energy in Vietnam. In addition to the direct divisions in MOIT, there are also two units established to manage the power sector and develop RE development policies, namely Electricity Regulatory Authority of Vietnam (ERAV) and Electricity and Renewable Energy Authority (EREA).

- EREA is in charge of developing national energy development strategy, planning and policy; and proposing mechanisms and policies to encourage and ensure development of electricity and renewable energy. EREA is assigned to develop RE Portfolio Standards (RPS) per suggested in the National RE Development Strategy (NREDS).
- ERAV is responsible for Vietnam's competitive electricity market and operates the electricity regulation fee mechanism as specified in the Electricity Law. ERAV oversees the DPPA Pilot Program to test the use of a DPPA mechanism.

EVN can deploy RPS assistance activities within its authority and instruct electricity units to connect to RPS systems in a timely manner. ERAV and EESD also can work on RE certification in conjunction with the People's Committees of provinces, EVN, and other power generation units (RE GENCOs).

Jurisdictions and collaborations at different levels of management

Under the 2010 Copenhagen Accord, GVN indicated that Vietnam considers a response to climate change as urgent and that all countries must take responsibility.[29] Vietnam has already undertaken numerous initiatives to combat climate change. The 2008 National Target Program to Respond to Climate Change (NTP-RCC) and the 2012 Decision No 25/QD-UNQGBDKH Working Regulation of the National Committee on Climate Change (NCCC) outlined the responsibilities of the different GVN bodies and ministries for carbon management and climate change.

MBIs in Vietnam are organized along sectoral lines with the following GVN responsibilities:

- MPI is responsible for planning, monitoring, and reporting;
- MONRE will develop guidelines and mechanisms especially on MRV;
- Line ministries are responsible for their respective sectors; and
- Provinces and cities are in charge of pilot programs.

Table 9 summarizes the MBIs implemented to date.

Table 9: Examples of MBIs with Impact on GHG Emissions

Tool	Examples	Legal Document
Taxes and fees	liquid fuels, coal	Environmental Protection Tax Law
Subsidies and tax incentives	Development of wind and solar power	Energy Efficiency Law; Biofuel policy
Marketable permits	CDM projects, payment for ecosystem services (PES)	Decree on CDM, PES
Information and awareness: eco-labelling	Green building code, energy labels	Energy Efficiency Law

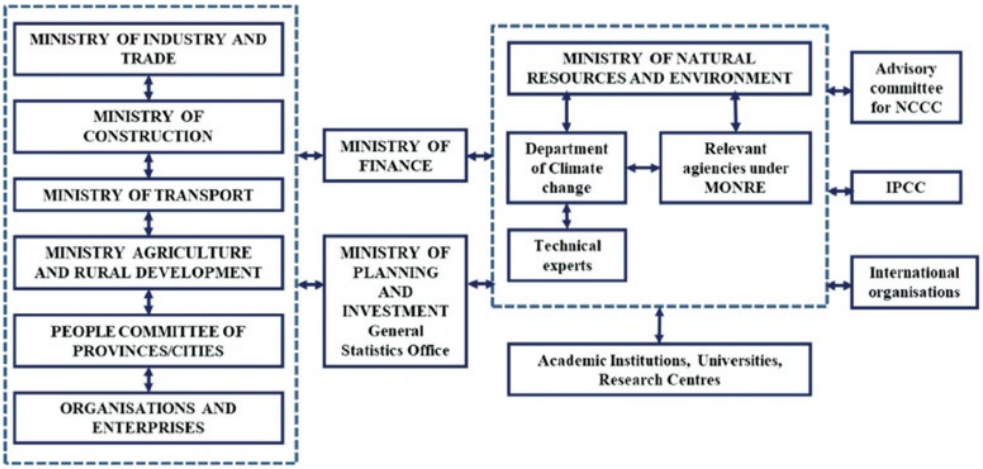
Good practices on ministerial collaborations in climate change/green growth initiatives (with reference to the energy sector)

The Copenhagen and Cancun Climate Change Conferences in 2009 and 2010, respectively, emphasized the importance of reporting national GHG emissions through biennial update reports (BUR). Expanded templates for these reports – "common tabular formats" – were finalized in the Doha summit (2012). Vietnam committed to produce its first and second such biennial update report (BUR1 and BUR2) in 2014 and 2017, respectively. Reflecting on the extent of the exercise and the shortcomings of the existing system, GVN, through MONRE, entered into a project with the Japanese International Cooperation Agency (JICA) to develop its own national GHG system. Elements of the national GHG system are shown in Figure 12. Noteworthy elements, include the:

[29] Letter of the Permanent Mission of the Socialist Republic of Vietnam to the United Nations dated 31/03/2010

- Primary role given to inventory preparation to MONRE and within it, to DCC;
- Inclusion of defined focal points in line ministries;
- Cross-sectoral and cross-ministerial support;
- Establishment of a longer-term permanent expert advisory board on methodologies;
- Provision of estimation, uncertainty assessment and quality assurance and quality control procedures

Figure 12. Institutional Arrangement of National GHG Inventory System in Vietnam



The NCCC, chaired by the Prime Minister, holds overall responsibility for climate change issues in Vietnam. The NCCC has numerous responsibilities, including:

- Advising the Government and the PM on all issues concerning climate change policy in Vietnam;
- Mobilizing and coordinating financial resources for implementation of the proposed strategies and programs to effectively respond to climate change;
- Designing research proposals responding to climate change requirements of the Government and the PM;
- Assisting the PM in the coordination between ministries and agencies;
- Developing interdisciplinary strategies and national programs concerning climate change and green growth projects;
- Supervising the implementation of climate change issues on behalf of the PM; and
- Directing and implementing all international cooperation activities.

MONRE is the lead ministry responsible for the implementation of the Proposed National Inventory System as well as for the formation of a domestic carbon market and participation in the international carbon market. The oversight responsibility of the GHG inventory preparation process has been assigned to the DCC as described above. The Vietnam Institute of Meteorology, Hydrology and Environment and the Vietnam Environment Administration undertook the emission estimation, quality control, and the preparation of the BUR reports with support from JICA experts. National consultants collected activity data and the Institute of Strategy and Policy on Natural Resources and Environment designed the national system proposal for GHG inventory preparation.

Vietnam has taken significant steps in developing a system that would increase the quality of information systems and procedures underpinning its national inventory. This increased capacity will increase the reliability of any instrument based on national or sectoral data.

6. Current practices for GHG reduction certificates in Vietnam

6.1 Overview of the GHG reduction certificates market in Vietnam

This section describes and assesses Vietnam's experience with carbon markets including the CDM, NAMAs and the general experience of Vietnam with MBIs in the area of climate change.

CDM

Vietnam boasts great potential for developing CDM projects in at least 15 sectors. These include energy efficiency, renewable energy, forestation and reforestation, change from the use of fossil fuels to reduce greenhouse gas emissions, recovery of methane from garbage landfills and coal mining pits for disposal or for power generation or daily-life use, recovery and use of associated gas from oil fields, and more.

As of May 2019, Vietnam has registered 255 CDM with the Executive Board of UNFCCC. According to MONRE, 59 of these are energy sector projects and 10 are waste sector. Utilizing the CDM offers numerous benefits for all parties, as outlined in Table 10 below:

Table 10: CDM Benefits

Party	Benefit
Project Owner	Project owners increase their return on investment by selling CERs to a buyer
Buyer	Buyers obtain a cost-efficient way of meeting reduction commitments under the Kyoto Protocol
Technology / Know-how Supplier	Suppliers of technology and know-how for the project expand their market presence
Project Developer	Project developers improve know-how and contribute to the project by providing consultancy services
Vietnam / GVN	Vietnam gains from the improved environmental conditions and better access to new technology in addition to the numerous economic benefits

The most important CDM registered project types in Vietnam are:

1. **Hydropower**: This is the most common CDM project-type in Vietnam. Hydropower projects have medium validation risks and low verification risks. However, these projects often have long construction periods and face numerous delays.
2. **Wastewater to generate energy**: Risk of validation is low / medium, construction time is short (often less than one year), and there are medium validation risks.
3. **Other renewable energy types**: There is a high potential for wind projects – two CDM projects have been registered. Bio energy projects also have a high potential. There are low / medium risks for validation and verification despite long construction periods.
4. **MSW-treatment:** There have only been a few projects so far, but there is a high potential for composting. Risks of validation are low / medium, there are medium risks of verification, and a medium period of construction.

RE, especially wind and solar, are priority CDM products. However, CDM projects must have actual costs to produce products greater than the actual selling price under the contract signed in order to qualify for the CDM subsidy. These types of projects have increasingly received interest by foreign investors. However, up to now, Vietnam only has two projects in this field recognized by the International Executive Board (EB) as CDM projects including: Wind Power Project 1 - Binh Thuan (recognized in 2009) and Bac Lieu Wind Power Project (recognized in 2016).

Heavy industries, which are operating in commercial markets with non-subsidized pricing on inputs and outputs, have a strong commercial incentive to monitor their energy use as energy costs are a key driver for commercial success. For example, the production of steel is based on batch-production. For every batch that is produced, detailed energy use data is captured as a key performance indicator in production. Companies in these industries monitor and manage their energy costs on an on-going (real-time) basis and have invested in energy efficiency projects to improve their own competitiveness. However, no steel companies have filed a CDM registration application for these investments because of: (1) the perceived complexity of the CDM; (2) the risk that an application would create substantial cost but an uncertain carbon credit issuance success; and (3) the perceived time lag between the investment and CDM application and return of positive cash flow (this usually takes about three years; investment decisions for such energy efficiency investments are usually based on the expectation that all invested capital is returned after three years, which means the CDM would not contribute to this return at all because of its long delay in re-payment).[30]

The future of the carbon market is complicated (the imbalance between supply and demand may be happened and this may significantly affect the carbon price drop). The requirement to rigorously meet the "complementary" criteria of this mechanism has become one of the main barriers to implementing CDM projects in transport and energy sectors are among other barriers that have contributed to the widespread application of CDM. If Vietnam cannot harmonize state policy with international policy, the country will not be able to overcome financial and technological barriers to participate in the low carbon market.

Nationally Appropriate Mitigation Actions (NAMA)

Scaled-up mitigation programs, such as **NAMAs,** are voluntary country engagement proposals to the UNFCCC. These are emerging mitigation instruments that seek to bring together public and private players into a coordinated operational framework and an overarching financial architecture, blending domestic and international resources to be able to scale-up the most promising (i.e., environmentally and economically effective) mitigation actions.[31] NAMAs require an integrated platform for their operation and management through effective engagement between national regulators and planners, private sector actors, domestic and international financial institutions, NGOs, and business organizations. There are three types of NAMAs distinguished based on their funding sources:

- **Unilateral NAMAs**: These are domestically financed voluntary mitigation actions. The MRV approach is defined domestically.
- **Supported NAMAs**: Mitigation actions are taken with international support. The MRV approach will be more stringent to ensure support.

[30] This aspect will play an important role in the later discussion on the structuring of RECs incentives: it is important to note that an incentive to promote energy efficiency investment has to have a much faster financial impact to be considered relevant by industry.

[31] Environmental effectiveness relates to the absolute GHG emission reduction potential; economical effectiveness (cost-effectiveness) to the potential in relation of the GHG achieved per USD spent.

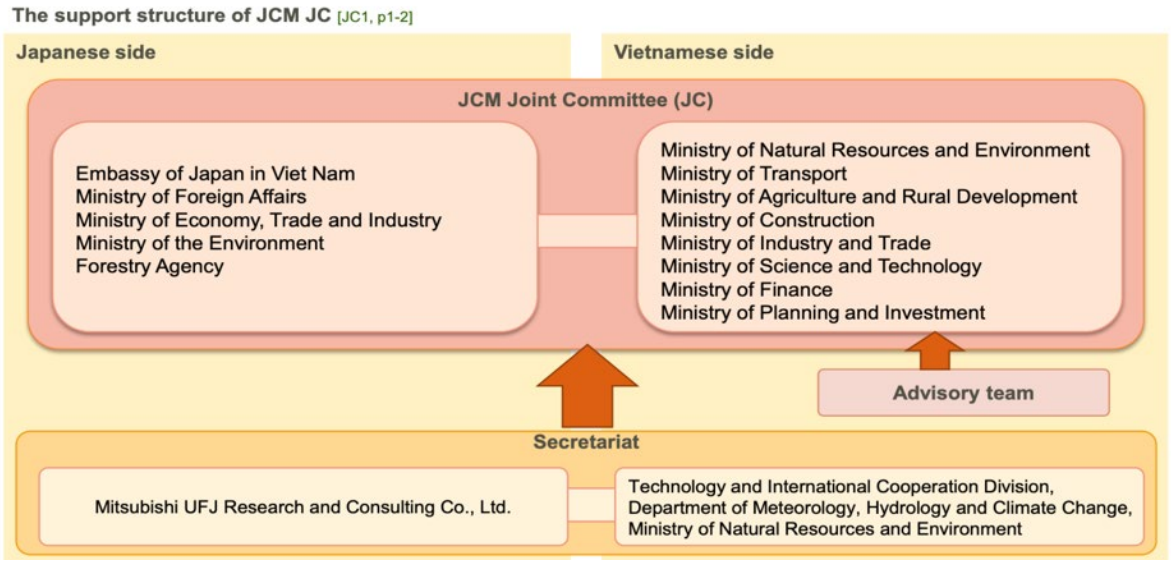
- **Credited NAMAs**: These are mitigation actions that could be credited for sale in the global carbon market. MRV requirements would be the most stringent to ensure additional global emission reduction.

In Vietnam, several measures lay the groundwork for implementing NAMAs in the waste, industrial (steel, cement, chemical), and power sectors. A NAMA can include policies, programs, and/or projects implemented at the national, regional, or local levels. The UNFCCC's prototype registry lists NAMAs currently being prepared, those being implemented, and those looking for recognition. Vietnam's NAMAs are all currently in the planning stage and are not yet listed on the UNFCCC prototype registry. The country is currently working on a roadmap that lays out policy proposals for implementing carbon pricing and MBIs as well as developing MRV and accreditation systems.

Joint Crediting Mechanism (JCM)

The Government of Japan launched the Joint Crediting Mechanism (JCM) also known as the Bilateral Offset Credit Mechanism (BOCM) based on the principles of the Paris Climate Agreement. The JCM/BOCM aims to facilitate sharing of Japanese low-carbon technologies, products, systems, services, and infrastructure thereby resulting in the reduction of GHG emissions in developing countries. The main feature of JCM/BOCM is that it promotes climate change mitigation actions through bilateral agreements primarily between Japan and developing countries. The JCM/BOCM mechanism uses a mixed committee of government officials of both countries established to develop and review regulations, guidelines, methodologies, etc. to promote this mechanism to work. The registration of projects and the issue of credits are also carried out by both countries (Figure 13). The big difference between CDM and this mechanism is that all CDM processes are supervised by the CDM Executive Board (centrally power mechanism) while most JCM/BOCM processes are implemented in accordance with what has been agreed between the two countries involved (decentralization mechanism). Such decentralization structures will facilitate the promotion of mitigation actions tailored to the actual circumstances of each developing country and make this mechanism simple and practical. The JCM/BOCM enables Japan to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another country. Each ERU, equivalent to one ton of CO_2, can be counted towards meeting Japan's NDCs. Japan's Minister of Economy, Trade, and Industry (METI) and MONRE signed a memorandum of cooperation on low-carbon growth between Vietnam and Japan in July 2013. This should eventually result in the implementation of a JCM between the two countries.

Figure 13. The institutional arrangements of the JCM in Vietnam



6.2 Application of GHG reduction certificates in Vietnam: national focal points, registrars, transaction management

The Vietnamese economic system has undergone deep structural changes since the onset of reforms in the mid-1980s with exceptional growth in the three decades that followed. These reforms introduced elements of a market-based economic system in many sectors, opening up sectors to private initiative and foreign joint ventures. However, some essential sectors remained outside of the scope of the reforms, mainly in publishing, irrigation, public services, and some large corporations important to the economy (i.e. oil, gas, and electricity).

Vietnam has been active in framing a policy framework for green growth, including legislative pieces towards green taxation, a potential carbon tax, targets, and goals for reducing GHG emissions and intensity, and incentives for the implementation of low carbon options. The policy framework includes domestic instruments as well as the use of international carbon finance instruments, such as NAMAs. Vietnam has experience in the CDM market and is embarking on the preparation of NAMAs in various fields including waste, steel, and iron as well as the building sector. The overall policy context is thus conducive to the use of MBIs to combat climate change.

Despite some progress in policy development noted above, national systems are not yet fully operational in Vietnam. In most cases it is considered more appropriate to anticipate a bottom-up MRV system through the use of either crediting standards such as those used under the CDM including sectoral approaches, Lotus standards (for energy efficiency rating of buildings), or through monitoring regulations akin to those in current day emission trading schemes. Particularly with regards to RE, there remains a lack of policies or policy implementation mechanisms that support developers, producers, and utilities in complying with existing policy efforts and contributing to RE development and targets.

For crediting, there is of an overall crediting framework or overall institutional arrangements at the national level. Only the specific institutional set-up for CDM and the JCM was formalised, as described in the previous section. In the CDM, the role of MONRE as DNA is very clearly defined by the UNFCCC.[32] In addition, the Vietnam Environmental Protection Fund under MONRE was formulated[33] to manage the financial flows in CDM credit sales. As under Vietnamese banking laws CDM project developers cannot receive money directly from the international buyers of the CDM credits, the Vietnam Environmental Protection Fund plays a role as an intermediary. The Fund receives the revenues from the international sale of credits, and after deducting a management fee of 1.2-2% of the credit value it transfers the money to the project developers. The fees are to be used to cover administrative costs of the Fund and to finance a part of the FiT for grid-connected renewable electricity generation in Vietnam.

In the JCM, the roles and responsibilities of the institutions on the Vietnamese side were provided with a legal basis in the above-mentioned circular. The JCM secretariat supported by DCC under MONRE to help the JCM JC to monitor and guide applying project owners with the development of Project Designed Documents (PDD) and methodologies, designation of verifiers, JCM project registration, implementation monitoring and granting of credits. The verifiers of JCM projects are so-called Third-Party Entities (TPEs) which can be either an in-country organisation or an international organisation accredited under ISO 14065 by an accreditation body that is a member of the International Accreditation Forum based on ISO 14064-2 (e.g. Japan Quality Assurance Organisation, Deloitte Tohmatsu Sustainability, Co., Ltd).[34] Circular No 17/2015/TT-BTNMT also provides the legal basis for the role of, and

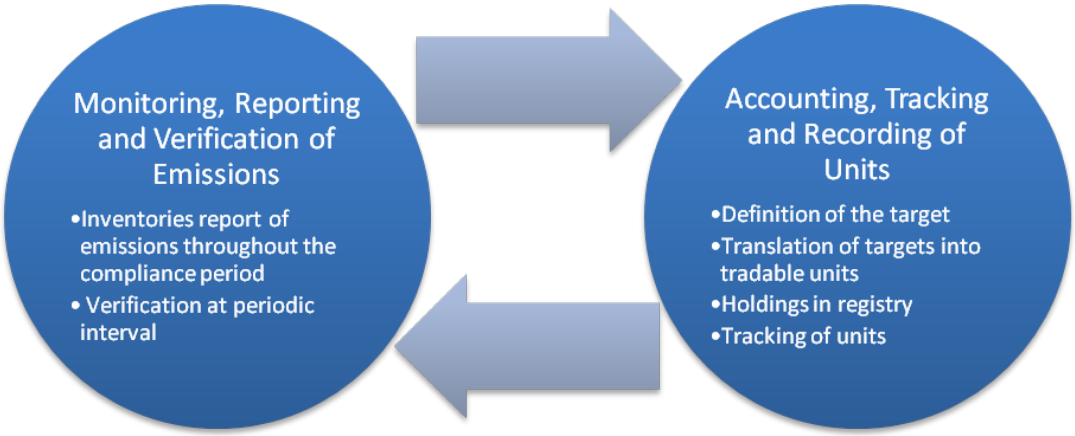
[32] The legal basis for the roles and responsibilities of MONRE is formed by Decree No 21/2013/ND-CP and PM Decision No 130/2007/QD-TTg on CDM in Vietnam
[33] Inter-Circular No 58/2008/TTLT-BTC-BTNMT
[34] JCM Third Party Entity (TPE): https://www.jcm.go.jp/vn-jp/tpes

requirements for the in-country JCM verifiers (*not* for international verifiers). Unfortunately, so far, no in-country organisation has been accredited for the JCM. All JCM TPEs involved in the nine registered JCM Projects in Vietnam are international organisations. Consequently, no in-country verifier capacity is available for a crediting mechanism in Vietnam, even though requirements are already available in the Circular. This is likely to be a similar challenge for the new crediting mechanism, where a lack of domestic verifier capacity could lead to a need to fall back on international verifiers.

The experience of GVN and the private sector (such as project developers) is an asset which can be used towards well-structured and managed GHG reduction certificates as well as for the development of national GHG markets including a reliable and robust MRV framework. Moving beyond the MRV functions to support all types of MBIs (such as RE markets) and link the instruments with their underlying goals (such as RECs), Vietnamese policymakers must develop a mechanism (Figure 14) that:

- Tracks the property of any rights/assets issued or generated from an MBI;
- Provides security of transactions;
- Provides for eventual linking of any schemes to other national or international schemes, while avoiding double counting with existing initiatives; and
- Ensures compatibility of the market-based instrument with the overall policy goal.

Figure 14. Accounting of Units and Monitoring of Emissions



7. Gap Analyses

7.1 REC in different RE mechanisms: how ownership would be determined in FIT, auctioning, and DPPA

Feed-in Tariff (FiT)

Through the application of the FiT mechanism, Vietnam has incentivized the private sector to invest and develop RE projects, especially grid-connected solar projects, rooftop solar power systems, onshore wind, offshore wind, and bio-block electricity. This has resulted in the addition of over 8,000 MW of new solar and wind power to the common network in just a few years. The rooftop solar cell market has also risen sharply from about 10 MW to 30 MW of total installed capacity. Despite this progress, Vietnam still faces certain difficulties and challenges in investing in the grid to integrate these power sources. The policy-side also has areas that need improvement. For example, the mechanism for risk sharing under electricity purchase contracts and the licensing process of adding projects to project planning, investment, development, and construction is time-consuming and complex. This form should

be used to notify first utility of transfer of responsibility from the FiT generator to another party. Examples might be where a FiT generator no longer resides at the installation address and passes control to another family member; where a company changes its directors or where a FiT generator has passed away. However, there have been no guiding regulations about how RECs are treated under the FiT.

Auctioning

RE auctions, also called demand auctions or procurement auctions, are mechanisms in which the government issues bidding invitations for the development of a specific RE project. Project developers participating in the auction submit a proposed unit price per unit produced. The government evaluates offers based on price and other criteria and signs a PPA with the winning bidder. Vietnam typically utilizes reverse auctions. Investors are invited to bid for RE projects and those with lower investment cost will be selected. Thus, the projects tend to be implemented at lower cost and have the potential to reduce costs, encourage more capable participants and increase benefits to customers.

There are currently no guiding regulations outlining the treatment of RECs. In practice, project developers are generally allowed to deal with the environmental attributes of their projects however they see fit.

DPPAs

DPPA is a mechanism that allows the direct transaction between a power generator and customer. Generally, power producers do not sell power directly to end-users, but instead trade with the power buyer in accordance with regulations. This overall mechanism helps the market operate efficiently, minimizes costs, and utilize the power infrastructure. Countries around the world have practiced DPPA, whereby RE producers are allowed to trade directly with customers. The power product is still physically transmitted and distributed through grid and power infrastructure as traditional power transactions. However, on a transactional level, the direct purchase between the producer and the buyer will reduce the intermediate stages such as trading with wholesalers or distributors, reduce transaction costs, increase the competitiveness of RE, and promote RE. Registry of RE GENCO power deliveries is essential to establishing the credibility of the DPPA Consumer's support for RE. This is often done through a REC registry, which provides three features critical to the DPPA:

1. The time-and-place stamping for generation, which is critical to demonstrating the provenance of renewable electricity;

2. The serialization of environmental attributes associated with the generation of each MWh of power to ensure unique attribution of ownership of environmental attributes (i.e. no "double counting"); and

3. The ability for buyers to claim use of the environmental attributes, in line with global reporting criteria, to demonstrate progress against sustainability commitments in a credible and transparent way.

4. Under DPPA, RECs ownership will be guided by the PPA between the project developer and EVN as well as the contract for differences agreement between the project developer and end-user.

7.2 Analyses of gaps, barriers, and risks with reference to international leading practices

To encourage the investment in RE, GVN has applied preferential policies on the purchase price of FiT electricity. However, policies related to carbon credits and RECs are yet to be developed. There is no unambiguous recognition that RECs can be owned as a separate and divisible attribute of RE generators. RE100's Guidance on Credible Claims (Section 2.1.1) outlines the necessary and sufficient principles for internationally acceptable REC processes, including ownership, transfer, and expiration of RECs. Table 10 evaluates Vietnam's current capacity with regards to these principles, specifically identifying the perceived gaps, barriers, and risks. Crucially, while Vietnam has established the policy framework for an RPS that could drive considerable demand for and use of a REC market, the associated policy document does not specify how RECs are to be used to support tracking and compliance with the RPS.

Table 11: Perceived gaps, barriers, and risks related to REC process

Element	Current Carbon Credits process	Perceived gap, barriers, and risks for Viet Nam
Policy	Encouraging the development of human resources in the overall policy mechanism has been expressed. RPS has been established for the milestones of 2020, 2030 and 2050 in the Vietnam's RE Development Strategy for the power generating units that have the installed capacity of power sources greater than 1,000 MW, the power distribution units that have the RE sources-based produced and/or purchased electricity, and the end users that consume RE sources-based electricity. The MOIT is responsible for regulating the minimum rate of RE sources of power generation and distribution units annually.[35] However, up to now, the RPS mechanism has not been formed to set up a market for purchasing REC. Internationally, RPS and RPO regimes are typically implemented through REC tracking systems.	Current laws/regulations should be updated to unambiguously recognize that RECs can be owned as a separate and divisible attribute of RE GENCOs. By not identifying the REC instrument(s) that entities must use for RPS compliance, this has hindered GVN's ability to monitor and enforce compliance with the program.
Legal Enforceability	Legally enforceable contractual instruments must include "property rights" to environmental and renewable attributes of generation. That is, there must be a legally enforceable contract in place to back the exchange of attributes as property rights	The existing regulations mentioned in the previous section are too general and do not provide sufficient detail for contracts, energy attribute certificates in a tracking system, etc.[36] Legal enforceability does not necessarily require governmental programs or

[35] Decision No. 2068/QD-TTg of November 25, 2015, on the development strategy of renewable energy of Vietnam by 2030 with a vision to 2050.

[36] Decision No. 130/2007/QD-TTg of August 2, 2007, on a number of financial mechanisms and policies applicable to investment projects under the clean development mechanism; Joint Circular No. 58/2008/TTLT-BTC-BTN&MT; Government Office's Official Letter No. 1843/ VPCP-QHQT of March 23, 2010, on the formulation of financial mechanisms for the trading in certified emissions reductions (CERs) for CDM projects funded with interest-hearing ODA loans onlent by banks; Joint Circular No. 204/2010/TTLT-BTC-BTN&MT on amending and supplementing some provisions of Joint Circular No. 58/2008/TTLT-BTC-BTN&MT; Decision No. 1775/QĐ-TTg on approval of project of greenhouse gas emission management; management of carbon credit business activities to the world market

Element	Current Carbon Credits process	Perceived gap, barriers, and risks for Viet Nam
		legislation to create or recognize a market or energy attribute certificate, only that the mechanism for definition and conveyance/transfer of the attributes is legally enforceable. For managing contracting options and risks between investors and buyers, stable and supportive policies are required as well as the ability to negotiate terms and conditions for supply contracts.
Tracking	In general, the standard practice for governments is to either establish an electronic REC tracking system or to engage external service providers to provide services in line with national rules. To make a credible RE use claim depends largely on reliably tracking RE attributes, verifying exclusive delivery by generators and suppliers, and verifying exclusive ownership of attributes by grid customers buying RE. Allocating RE generation to specific grid customers requires contractual instruments to convey attribute information from generation to end-use. These contractual instruments make specified source purchasing on the grid credible and verifiable.	Vietnam does not have its own tracking system, and there is limited domestic capacity to implement a system that would meet international standards. Global tracking systems can be customized for the country to eliminate pressures on GVN oversight and development, but long-term capacity building is important to ensure domestic ownership over time. If credits are going to be issued, traded and/or used as part of the new crediting mechanism, a national system is needed to register the new credits and to track, record and manage them while they are being held, traded or redeemed in or between different registry accounts. This is preferably set up as an online registry hub.
Reporting	Data aggregation and analysis is completed for the purpose of effective enforcement. In terms of GHG inventory's data preparation, the cooperation between ministries is very loose.	Current regulations do not include a strong-enough incentive structure to promote reporting. Regulated entities prepare different reports for different government entities, which creates. An effort to streamline these requirements into one integrated reporting process would be welcome.
Third party verification	The reported data is usually checked by the third party for audit or verification.	The entities will have to comply with the rules and modalities agreed internationally. For a domestic crediting mechanism, Vietnam can decide this unilaterally.
Approval and demand from potential buyers	Major buyers of RECs include companies with reporting preferences aligned with RE100; CDP, GHG Protocol, SBTi; LEED; We Mean Business Coalition; Business Renewables Council; Renewable Energy Buyer's Alliance; Green-e Standard, or those entities which are	If GVN establishes its own tracking system, it will need considerable support to ensure compliance standards required by RE100, CDP, and others. For a domestic REC system to be successful, it would either require approval from international buying entities, or domestic policy (such as the

Element	Current Carbon Credits process	Perceived gap, barriers, and risks for Viet Nam
	required to procure clean energy under RPS or RPO obligations.	RPS) to mandate that certain entities procure RECs using a specified standard and tracking system. Further work remains to be done to align the nascent Vietnamese RPS policy with the implementation of a REC standard and tracking system.
Organization(s) to issue credits	The CDM EB and the JCM JC are the issuing bodies of credits for the CDM and JCM respectively. There is currently no designated domestic organization to issue credits under a REC system in Vietnam; however, both existing international registries operating in Vietnam have interim entities that can be used to issue RECs while GVN considers which domestic entity to appoint.	For a domestic crediting mechanism, an issuing organization would need to be established in Vietnam. In line with Vietnamese customs, this would be a national institution (e.g. a ministry or a joint ministerial steering committee) where credit issuance is centralized.

W1.3 Assessment of Market Demand for RECs in Vietnam

W1.3 of this Report will support a successful RECs policy in Vietnam, by assessing the market demand for RECs in Vietnam. W1.3 of this Report consists of the following sections:

- **Section 8** provides an overview of the current REC market in Vietnam, including advent of the RECs market and the size of the current market
- **Section 9** discusses the potential for development of RECs market in Vietnam, including potential market players and the size of the potential market considering future RE projects in Power Development Plans, Renewable Portfolio Standards, and other compulsory compliance metrics
- **Section 10** provides the status of RECs registration activities in Vietnam, including a list of active REC registrars, ownership and registration of RECs by operating RE GENCOs, market penetration of RECs among renewable power deliveries, review of REC services currently provided, and a review of the current gaps and barriers to RECs in Vietnam.

8. Overview of the current REC market in Vietnam

8.1 Advent of the RECs market in Vietnam

Vietnam ratified the UNFCCC in November 1994 and the Kyoto Protocol in September 2002. However, Vietnam's market for RE environmental attributes did not develop until the Kyoto Protocol came into force in February 2005 upon Russian ratification. The Kyoto Protocol established three flexible mechanisms to spur sustainable development. One of these three mechanisms, the CDM incentivizes developed countries (industrialized countries) to support developing countries to carry out environmentally friendly projects. In Vietnam, as of September 2020, there are 306 registered CDM projects, 234 of which are grid-connected RE projects (solar, wind, hydro, biogas, and biomass)[37]. Among the registered RE grid connected projects, 60 have received Certified Emission Reduction (CER)[38] issuance of 12,531,399 CERs credits. Under the voluntary carbon market, Vietnam has 26 RE (wind, solar and hydro) grid connected projects registered under Gold Standard[39] and 23 solar and wind power projects registered under the voluntary Verified Carbon Standard (VCS)[40].

In the first Kyoto commitment period[41] 2008 - 2012, the price of CER credits in Vietnam was almost equivalent to the price of EU allowance credit in the European market. During the second commitment period 2013-2020, CER credits were only partially used for compliance markets in Europe so the price was very low due to excess supply. The current CER credit price is traded at around EUR 0.3 per credit in the spot market. As in Figure 15 below, in the recent 2 years from Jul 2018 to Jun 2020, the carbon price (CER) varied from 0.15 EUR to nearly 0.35 EUR per credit.

[37] https://www.iges.or.jp/en/pub/iges-cdm-project-database/en
[38] Each CER equivalent to 1 tons of CO2 emission
[39] The "Gold Standard," the standard and certification body established by WWF, launched a new Gold Standard Renewable Energy Label to assure businesses, governments, and other buyers of renewable electricity attribute certificates, that their purchase supports the expansion of RE generation capacity and achievement of the UN's SDGs
[40] https://verra.org/
[41] https://ec.europa.eu/clima/policies/strategies/progress/kyoto_1_en

Figure 15. CER price in the compliance market in the recent two years[42]

RECs, also called green tags, green certificates, renewable energy credits, or tradable renewable certificates, are another type of environmental attribute. They are a market-based commodity designed to facilitate transactions between the buyers and sellers of renewable energy. RECs allow customers to purchase the environmental attributes associated with the generation of renewable power, which can in turn provide economic support to of RE projects and project developers.

In the carbon market, the tradeable units are CERs or Voluntary Emissions Reduction (VER), measured in ton of CO_2 equivalent emission reduction (tCO_2e). In the REC market, the unit is MWh. The relationship between VER, CER and REC certificates depends on the carbon intensity of the electricity grid where the user is connected. For example, the average emission factor for an Asian electricity grid is 0.835 tCO_2e/MWh[43]. This means that by generating one MWh, the system will emit 0.835 tons of CO_2 equivalent from the fossil fuel-based power plant. In Latin America, the grid emission factor is much lower: 0.468 tCO_2e/MWh. This means that on average, Latin American generators emits fewer greenhouse gases for producing the same amount of electricity as a generator in Asia. Table 11 shows the average emission factors for generators in Vietnam.

Table 12: Vietnam Grid emission factor (GEF)[44]

Year	2014	2015	2016	2017	2018
GEF (tCO_2e/MWh)	0.6612	0.5764	0.9185	0.8649	0.9130

RECs have the flexibility to be either “bundled” or “unbundled.” Bundled RECs are sold in conjunction with the underlying electricity product. Unbundled RECs are sold separate from the physical electricity.

In Vietnam, the Government has issued several FiT mechanisms to support investment in RE. These FiTs range from 7.03 US cents/kWh to 10.05 US cents/kWh depending on the RE source. However, the GVN FIT decision does not mention how the environmental attributes from the generated electricity are to be treated. Therefore, project owners are currently free to sell the unbundled RECs to clients in domestic or international markets.

Before 2015, RE project developers could only choose carbon credits when claiming RE environmental attributes. However, since the launch of global commercial REC registrars such

[42] Source: https://www.theice.com/products/26238355/CER-Daily-Futures/data?marketId=1240279&span=3 (accessed in Jul 2020)
[43] IGES grid emission factor database 2020: https://www.iges.or.jp/en/pub/list-grid-emission-factor/en
[44] Source: MONRE

as the I-REC Standard in 2014 and APX's TIGR Registry in 2016, project developers can now register under these RECs tracking systems. Given the decreased demand and falling carbon credits price, RE projects previously registered under carbon standards have now begun being registered under the I-REC or TIGR system. As of September 2020, 20 projects formerly registered on CDM had switched their registration to issue I-RECs as opposed to CDM (see Table 13).

Table 13: List of projects registered under both CDM and I-REC systems

No	Name	Commissioning Date	Registration Date	Electrical Capacity (MW)
1	Ia Grai 1 Hydropower	08/08/2012	01/10/2015	10.8
2	Thanh Thuy Hydro Units 1 and 2	29/06/2011	01/10/2015	20
3	Phu Mau Hydropower Project	08/09/2008	01/01/2016	5.6
4	Dak Doa Hydropower	26/03/2011	01/09/2016	14
5	Chieng Cong Hydropower	09/03/2011	01/01/2017	11.4
6	Nam Pia Hydropower	05/08/2009	01/01/2017	15
7	Se San 4a Hydro	15/07/2011	01/04/2018	63
8	Nam An Hydropower	04/09/2012	01/06/2018	6
9	Dasiat Hydropower	01/01/2010	01/01/2019	13.5
10	Nam Xa Hydropower Project	05/12/2015	01/01/2019	9.6
11	Nam Xay Noi 2 Hydropower Project	23/07/2018	01/01/2019	12
12	Ta Co Hydropower Project	01/09/2012	01/01/2019	30
13	Hang Dong A1 Hydropower Project	30/01/2013	01/02/2019	8.4
14	Muong Kim Hydropower Project	08/09/2010	01/02/2019	13.5
15	Hang Dong A Hydropower Project	25/10/2015	01/04/2019	16
16	Khao Mang Hydropower Project	20/01/2017	01/04/2019	30
17	Khao Mang Thuong Hydropower Project	27/09/2015	01/04/2019	24.5
18	Muong Kim II Hydropower Project	26/07/2019	01/04/2019	10.5
19	Song Bac Hydropower Project	14/04/2014	01/01/2020	42
20	Tram Tau Hydro Power 30MW	26/06/2018	01/01/2020	30

Project developers have reported switching from carbon emission reduction products to RECs because REC tracking systems have the following benefits:

- Simple registration and issuance process
- Simplified standard methodology for quantifying REC units, unlike the complex standards for carbon credits

- Less time consuming from registration to credit issuance (3-4-month process for RECs vs. 2-3 years for carbon credits)
- Less expensive certification process
- Higher market price compared to current market CER price

8.2 Size of current market

The size of the REC market in Vietnam is determined by (i) the total amount of RE generation from eligible projects, and (ii) demand for RE for both voluntary and compliance purposes. Demand for RECs in Vietnam will come, in the first instance, primarily from RE100 or SBT firms that have load in Vietnam, and brokers and traders active in Asia. In the future, a Vietnamese compliance market (such as an RPS or RPO) could significantly increase demand for RECs. With respect to the current voluntary market and associated demand, the total combined international demand for RE from the RE100 firms is above 220 TWh per year, with a high concentration of load in Asia, where supply chains are located. Recent figures from RE100 show that 43 percent of the green energy sourced globally by RE100 members came from unbundled renewable attribute certificate purchases.[45] If RE100 members combined to form a country, in 2018 they would have been the 21st largest electricity consumer in the world with a total consumption of 228 terawatt-hours (TWh).[46] Among 195 global companies endorse RE100 across worldwide operations. 38 member companies have operations in Vietnam.[47]

At the national level, Vietnam committed in the latest NDC report to reduce 11.2 percent of its GHG emissions in the energy sector as compared with the BAU scenario. This is equivalent to 104.3 million tons of CO_2e. Vietnam has developed and issued several important policy documents on climate change response at the national level, such as the:

- Resolution of the Politburo of the Central Committee of the Communist Party of Vietnam on the orientation of Vietnam's National Energy Development Strategy to 2030, with a vision to 2045 (2020);
- Vietnam's REDS to 2030, with a vision to 2050 (2015); and
- Revised National Power Development Plan (PDP) for 2011-2020 with a vision to 2030 (revised PDP VII) (2016).

With respect to potential supply of RECs and given that a REC equals 1 MWh of RE, the theoretical size of the current 2020 Vietnam REC market is 89,000,000 RECs[48]. According to the REDS, Vietnam will increase the total electricity production from RE sources from approximately 58 billion kWh in 2015 to 101 billion kWh in 2020, approximately 186 billion kWh in 2030 and 452 billion kWh in 2050. The share of RE-based electricity production in the total national production is planned to increase from 35 percent in 2015 to 38 percent in 2020; 32 percent in 2030 and 43 percent in 2050.

Table 14: Installed power capacity (MW) by renewable sources in Vietnam[49]

Energy source	2010	2015	2016	2017	2018	2019	202050
Hydro	9,277	16,655	18,116	19,103	19,722	20,727	22,465

[45] https://www.theclimategroup.org/sites/default/files/dec_2019_re100_progress_and_insights_annual_report.pdf
[46] RE100, 2019 annual report
[47] https://energy-evaluation.org/wp-content/uploads/2019/11/eeap2019-6.1-johnbrucewells-presentation.pdf
[48] 89 million RECs are the theoretical potential based on the total generated electricity from RE source (i.e. hydro, wind, solar and biomass) including hydropower project with capacity over 30 MW. If excluding more than 30 MW hydropower plants, the potential RECs would be 38.6 million RECs.
[49] Source: Electricity of Vietnam (EVN)
[50] Estimated data and interview with expert

Wind	30	135	159	189	205	419	859
Solar PV	-	-	-	-	84	5,000	7,150
Biomass	56	141	151	236	446	471	471
Total RE	**9,363**	**16,931**	**18,426**	**19,528**	**20,457**	**26,617**	**30,945**
Total system (MW)	**21,948**	**40,069**	**43,548**	**45,650**	**49,651**	**56,711**	**62,289**

Table 15: Electricity generation by renewable sources in Vietnam[51]

Energy source	2010	2015	2016	2017	2018	2019	2020 52
Hydro (including the plants with capacity more than 30 MW)	27.9	58.2	64.6	87.2	73.1	75.6	72.9
Wind	0.1	0.3	0.4	0.5	0.5	1.0	0.98
Solar PV	0.0	0.0	0.0	0.0	0.1	5.0	9.58
Biomass	0.3	0.7	0.8	1.2	2.2	2.4	0.34
Total RE Generation	**28**	**59**	**66**	**89**	**76**	**84**	**84**
Total system Generation (TWh)	**101.4**	**159.4**	**178.6**	**194.4**	**210.6**	**234.7**	**245.9**

9. Potential for development of RECs market in Vietnam

9.1 Potential market players

REC markets typically include four main actors: Market Oversight, Issuer, Registrants, and Buyers. In addition to these three participating groups, there is typically an overseeing body which provides the rules and infrastructure in which the market functions.

Market Oversight

In both domestic and international markets, there needs to be an entity that establishes and ensures compliance with the governing rules of the REC market. This can be the same entity that manages the registry infrastructure, or a separate entity. This structure provides assurance to all stakeholders that RECs meet specified quality standards and can be trusted as an instrument. The registry itself is the infrastructure used for transactions. The issuers, registrants, buyers, and physical registry all act in accordance with the governing rules.

Issuer

The Issuer may be a government agency or an independent entity preferably acting with the recognition and support of the government authorities. The Issuer controls the registration of generating facilities, oversees and verifies the reporting of generation data, and issues RECs based on reported generation. In Vietnam, the Issuer can be a department in MOIT or an independent entity that is authorized by MOIT to play this role.

Registrant

Electricity generating facilities (GENCO) must be registered with the REC tracking system before RECs can be issued. GENCOs are able to create an account in a registry, register their production stations, and request REC issuance, either by themselves or through the use of a third-party agent. In I-REC terminology, the individual or organization tasked with registering

[51] Source: Electricity of Vietnam (EVN) and interview with expert
[52] Source: "Vietnam Wholesale Electricity Market 2021" by EVN-NLDC at VEPG ESR-TWG, April 22, 2021

the GENCO and requesting REC issuance is called the "Registrant" and in TIGRs terminology they are referred to as the asset owner. In the I-REC system the issuer is responsible for approving the requests to issue RECs, and in TIGRs system APX plays this role with support from a qualified reporting entity.

In Vietnam, more than 80 percent of the power sector is owned by three Power Generation Corporations (Power Generation Corporation No. 1, Power Generation Corporation No. 2, and Power Generation Corporation No. 3), EVN and IPPs including local and foreign investors as in the below figure. In addition, there are other owners: Vietnam Oil and Gas Group (PVN) that owns 12.99% of installed capacity, Vietnam National Coal and Mineral Industries Group (Vinacomin) that owns 4.37% of installed capacity. The distribution of power sector stakeholders is shown in Figure 16 below.

Figure 16. Share of power ownership in Vietnam[53]

Owner	Capacity (MW)	Rate (%)
EVN	20,539.65	60.27
PVN	4,429	12.99
Vinacomin	1,485	4.37
Local investors	4,765.6	13.98
Foreign investors	2,859.5	8.39
Total	***34,080***	***100***

Annexes 2 – 8 show the companies and renewable power plants in Vietnam that have the potential to be REC Registrants. The list includes the wind (Annex 2), solar (Annex 3), hydro[54] (Annex 4), biomass, waste, and biogas (Annex 5) power plants.

REC Buyer

REC Buyers can be public or private entities. They can be REC end-users (who use RECs to fulfil Scope 2 mandatory or voluntary targets set for their business activities) or brokers (who trade the RECs as products for profit purposes instead of retiring the RECs in the system). Buyers can approach GENCO directly or buy RECs via brokers. Sellers are also likely to be able to access a much wider market of interested buyers through using a REC broker.

Major Energy Consumers in Vietnam

Decree No.21/2011/ND-CP[1] defined major energy users as industrial and agricultural production establishments and transport units which annually consume energy of a total of 1,000 tonnes of oil equivalent (1,000 TOE) or higher, as well as construction works used as offices and houses, educational, medical, entertainment, physical training and sports establishments, hotels, supermarkets, restaurants and shops which annually consume 500 tonnes of oil equivalent (500 TOE) or higher. Under Decision No.1469/QD-TTg[1] dated October 28, 2019, Vietnam has more than 2,600 key energy consumers and these companies could also be the potential REC Buyers for offsetting their energy consumption.

In Vietnam, common REC Buyers include companies with international RE commitments, such as RE100, SBTi, the UN Fashion Industry Charter for Climate Action, as well as the major energy users (see box) in Vietnam.

[53] Source: Electricity of Vietnam (EVN) https://www.evn.com.vn/UserFile/User/tcdl/BCTN%202015_Fi_Final.pdf
[54] According to the I-REC database, the largest hydropower project which was registered in May 2020 has capacity of 2082 MW with commissioning date on 24/04/1980. However, to be in line with the REDS strategy, the list of potential registrants in Vietnam does not include also large hydropower projects but only consider the small hydropower plants with capacity of less than 30 MW.

9.2 Size of the potential market, considering future RE projects in PDP, RPS, and other compulsory compliance metrics.

Potential for RECs generation

Despite the strong growth, electricity demand per capita of Vietnam is still generally low compared to the rest of the world. In 2014, electricity demand per capita was 1.424 MWh, less than half of the worldwide average of 3.133 MWh per capita[55]. Under MOIT's BAU scenario, Vietnam's electricity demand is expected to increase exponentially to more than double by 2030, significantly faster than population growth. The Revised National Master Plan for Power Sector Development (RPDP7) has projects total installed power capacity to increase to 96,500 MW by 2025 and 129,500 MW by 2030. Similarly, electricity demand is expected to increase to 400 billion kWh in 2025 and 572 billion kWh by 2030 (see Table 16).

Table 16: Vietnam power sector structure

Category	Unit	Current situation		Revised PDP7		
		2019	2020	2020	2025	2030
Capacity	**MW**	**56,711**	**62,289**	**60,000**	**96,500**	**129,500**
Hydro (<30 MW)	%	11.60	12.56	5.66	1.91	1.48
Wind	%	0.7	1.4	9.9	12.5	21.0
Solar	%	8.8	11.5			
Biomass	%	0.8	0.8			
Electricity Demand	**Bil. kWh**	**235**	**259**	**265**	**400**	**572**
Hydro (<30 MW)	%	10.23	10.40	4.74	1.57	1.08
Wind	%	0.4	0.8	6.5	6.9	10.7
Solar	%	2.1	2.8			
Biomass	%	1.0	0.9			

Source: MOIT, Revised Power Development Plan VII

Potential RECs market size

Unlike the carbon market, under the REC market, most trades are done through individual bilateral agreements. The prices vary significantly depending on certificate origin and associated characteristics, such as location, age, device, technology, size, subsidy support, sustainability labels, etc. As such, there is not a single commodity price for RECs as is common in more fungible markets, such as the carbon markets. Therefore, in this report, the REC price[56] for analysis is based on interviews with project developers[57] as well as the Consultant's previous experience. In Table 17, the low price is the lowest price that the consultant offered to the project owners (US$0.25/REC) and the high price was the price that REC brokers offered to end user of REC:

Table 17: Average REC price based on interviews with consultant experience and project developers

	Low Price	Average[58] Price	High Price

[55] https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC
[56] Additional details can be found in Section 0 Costs..
[57] The interviews were conducted with 2 of 3 major project developers (mentioned in section 4 below) in Vietnam and information from 2 international REC brokers for Vietnam and SEA REC projects.
[58] Calculated as the average of the high and low price.

REC Prices	US$0.25/REC	US$1.15/REC	US$2.04/REC [59]

Table 18 estimates the potential RECs market size for two scenarios: (1) that 50 percent of the RE power plant will use the REC market; and (2) that 100 percent of the RE power plant will use the REC market. For each scenario, the Consultant has calculated the low, average, and high prices for the REC market value. Note, this estimation excludes hydropower plants with capacities over 30 MW, as directed by the REDS strategy.

Table 18: Analysis of REC price

Year	RECs generation (MWh)		LOW RECs market value (Mil. USD)		AVERAGE RECs market value (Mil. USD)		HIGH RECs market value (Mil. USD)	
	10%	50%	10%	50%	10%	50%	10%	50%
2020	3,858,920	19,294,600	0.96	4.82	4.42	22.09	7.87	39.36
2025	3,389,287	16,946,433	0.85	4.24	3.88	19.40	6.91	34.57
2030	6,740,371	33,701,857	1.69	8.43	7.72	38.59	13.75	68.75

10. Status of RECs Markets in Vietnam

10.1 List of REC registrars active in Vietnam

Globally, there are several different RECs systems operating independently, including:

- North American Renewable Energy Certificates (RECs)
- European Guarantees of Origin (GOs)
- I-RECs
- TIGRs
- National REC systems, such as Japan (Green Energy Certificates) and Australia (Large-Scale Generation Certificates)

This reports focuses on the two international REC registries I-REC and TIGR which are discussed in in Section 2.1.3. Table 6 provided a summary comparison of the two global RECs registrars. V-LEEP consultations with I-REC and TIGRs confirm that issuing RECs requires that the GENCO or its representative (i) create an account in the respective registry and undergo associated know-your-client checks, (ii) demonstrate ownership of the environmental attributes associated with the generation of power, and (iii) provide invoices (or similar) from the off-taker detailing the MWh output over an invoicing period (daily, weekly, or monthly). This information requires validation by I-REC and TIGRs, or the appointed issuer or QRE, respectively.

10.2 Ownership and registration of RECs by operating RE GENCOs in Vietnam

The Government of Vietnam has issued several FIT mechanisms and other incentives to support the investment in RE. These FITs range from 7.03 US cents/kWh to 10.05 US cents/kWh depending on the type of renewable sources and other incentives are summarized as in Table 19 below.

[59] Converted from 1.7 EUR/REC to 2.04 USD/REC

Table 19: FiT for Renewable Energy in Vietnam

Source of RE	Feed-in Tariff	Legal Framework	Note
Small hydro	Avoided cost tariff (ACT) applying to small renewable energy power plants (installed capacity of less than 30MW) varies by year, by season and by region[60]	Decision 4036/QĐ-BCT, 31 December 2019	For year 2020
Wind power	On-shore: 8.5 US cents/kWh Off-shore: 9.8 US cents/kWh	Decision 39/2019/QD-TTg, 10 September 2018	Commercial Operation Date (COD) before 31 October 2021
Biomass	Cogeneration CHP: 7.03 US cents/kWh Biomass: 8.47 US cents/kWh	Decision 08/2020/QD-TTg, 5 March 2020	
Solid waste to energy	Landfill gas capture for power: 7.28 US cents/kWh Incineration: 10.05 US cents/kWh	Decision 31/2014/QD-TTg, 5 May 2014	
Solar (PV)	Solar farm: 7.09 US cents/kWh Floating solar power: 7.69 US cents/kWh Rooftop net metering: 8.38 US cents/kWh	Decision 13/2020/QD-TTg, 6 April 2020	COD before 31 December 2020, after that time determined via auctioning

Biogas	Under the support of German Government, EREA is working with GIZ on the mechanism to support biogas power, i.e. the study of FIT for biogas in Vietnam. The expected first result will be available in the end of 2020.[61]	
All kind of RE sources[62]	Tax exemption	Imported goods to establish project fixed assets, materials and semi-finished products that are not domestically produced for the first 4 years followed by a 50% reduction in the next 9 years.
	Other Incentives	Land use, capital, and fees for environmental protection activities
	Investments	Loans of up to 70% of the total investment cost from the Vietnam Development Bank (VDB) at an interest rate equivalent to that of a 5-year government bond plus 1% per year.

However, the environmental attributes from generated electricity are not mentioned in any of the above government decisions or supporting mechanisms. The environmental attributes from projects participating in the FiT, preferential rate, or other similar incentives are not currently required be transferred to the Government. For future FiT and subsidy structures, the government may wish to include clauses to clarify attribute ownership rights; however, regulation should likely look to future contracts rather than act retrospectively.

The Paris Agreement, adopted at the 21st session of the Conference of Parties to UNFCCC in 2015, is the first legally binding document for all parties to address climate change. The Paris Agreement entered into force on November 4, 2016, thirty days after 55 countries, representing 55 percent of global emissions, deposited their instruments of ratification, acceptance, or accession with the UN Secretary-General. Vietnamese Prime Minister Nguyen Xuan Phuc signed Resolution No. 39/NQ-CP on behalf of the Government of Vietnam on October 31, 2016, ratifying the Paris Agreement.

The Paris Agreement sets ambitious long-term mitigation goals to limit temperature rise to below 2°C) and to pursue efforts to limit the temperature increase to 1.5°C. The core building

[60] Please find the detail table in Annex 6. Avoided Cost Tariff for small hydro power projects in year 2020
[61] http://gizenergy.org.vn/media/app/media/Events/GIZ_EREA_Webinar_FiT%20Biomass_2020.pdf
[62] http://gizenergy.org.vn/media/app/media/Support%20Mechanism%20for%20RE%20-%20Fact%20file_27%2004%202016_with%20appendix.pdf

blocks of the Paris Agreement are the NDCs. NDCs represent the national commitments that countries are willing to make to contribute to global climate change mitigation. On September 29, 2015, Vietnam submitted its Intended Nationally Determined Contributions ("INDC") to UNFCCC pledging to cut its domestic GHG emissions by eight percent against its BAU scenario by 2030. As a conditional contribution, the 8 percent contribution may be increased to 25 percent if it receives enough international support. In September 2020, Vietnam submitted its updated NDCs increasing its unconditional emission reduction target to cutting GHG emissions by nine percent by 2030. Vietnam's conditional emission reduction target was updated to a 27 percent reduction. Development and use of RE is one of the main areas Vietnam will prioritize to achieve these ambitious targets.

The Paris Agreement also established a new framework for voluntary cooperation, establishing international carbon market mechanisms to achieve climate mitigation contributions. Article 6.2 of the Paris Agreement allows countries to use 'internationally transferred mitigation outcomes' (ITMOs) to achieve their NDCs. Article 6.4 also establishes a new crediting mechanism under international oversight. Avoiding double counting of ITMOs is a key principle of Article 6 and the Paris Agreement:

> *"Parties shall account for their nationally determined contributions. In accounting for anthropogenic emissions and removals corresponding to their nationally determined contributions, Parties shall promote environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement*"
>
> – Article 4.13, Paris Agreement.

Double counting is the situation in which a single ITMO is counted more than once towards achieving climate change mitigation. Double counting can occur through double issuance, double use, or double claiming, as detailed below:

- **Double Issuance**: A situation in which more than one REC unit is issued for the same generated electricity (MWh). This issue could happen due to the registration of the same project under two different REC tracking systems or twice under the same system.
- **Double Use**: A situation in which the same REC unit is counted twice (for example by the same or separate REC Buyers) towards achieving climate change mitigation. This overestimation of the total mitigation achieved could be resolved through robust registry systems to track ownership and retirement of RECs.
- **Double Claiming**: A situation in which the same RECs are claimed by two different entities towards achieving climate change mitigation: once by the country/company using RECs to offset their Scope 2 electricity consumption and once by the country/company using as the emissions reduction toward their GHG emission target.

To avoid double counting, GVN may wish to conduct stocktaking and coordination activities, to ensure REC and carbon stakeholders are aware of each other's activities, and to design appropriate venues of communication between accounting instruments and respective government agencies

I-RECS in Vietnam

Between 2015 and September 2020, there have been 47 projects in Vietnam registered with I-RECS. These 47 projects are responsible for 1,107.1 MW of installed capacity, 3.58% of the total installed renewable energy capacity in Vietnam electricity grid. Figure 17 shows the registration of I-REC projects by year and Table 20 shows the issuance of I-RECs by year. I-RECs registered projects accounted for 0.10 percent, 0.30 percent, 0.36 percent, 1.15

percent, 0.90 percent, and 0.04 percent of the total RE generation in 2015, 2016, 2017, 2018, 2019 and 2020 (through June 2020).

Figure 17. Number of registered I-REC projects over years

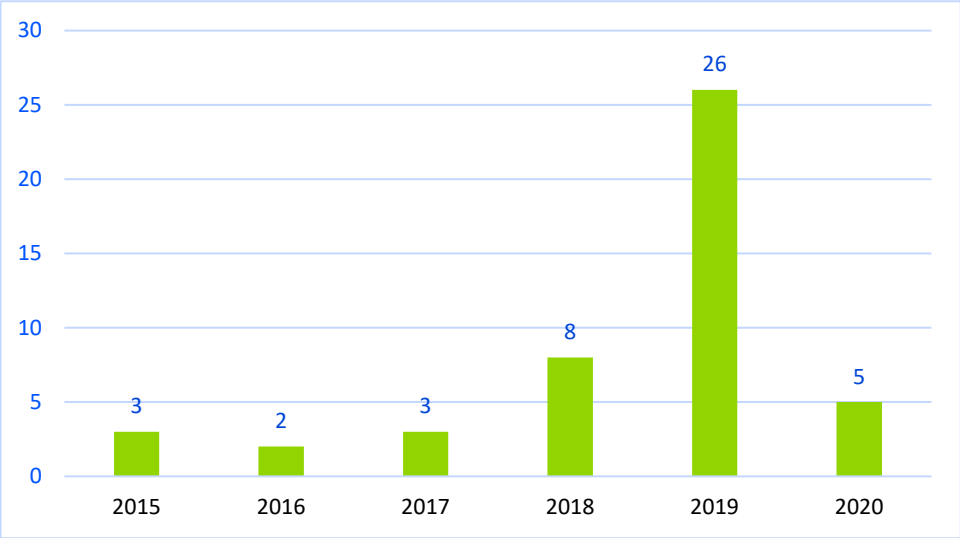


Table 20: Issued I-RECs and Market Value Estimation 2015-2020

Production year	Total Number of I-RECs issued	Estimated Market Value – Low (USD)[63]	Estimated Market Value – High (USD)[64]
2015	59,522	US$14,881	US$121,425
2016	196,193	US$49,048	US$400,234
2017	315,854	US$78,964	US$644,342
2018	869,578	US$217,395	US$1,773,939
2019	758,604	US$189,651	US$1,547,552
2020 (through June)	15,641	US$3,910	US$31,908
Total	**2,215,392**	**US$553,848**	**US$4,519,400**

The list of the 47 projects registered under I-RECs in Vietnam is shown in Table 22.

TIGR in Vietnam

TIGRs are actively traded in Vietnam. A total of 4,064 and 60,511 TIGR certificates were issued for solar generation projects in 2018 and 2019, respectively. In 2020, there have been 24,470 TIGR certificates issued for solar generation to date.[65] The three registered under TIGR in Vietnam is shown in Table 6. These three projects have a total combined installed capacity of 123.4 MW. This is 0.4 percent of the total installed renewable energy capacity in Vietnam electricity grid. TIGRs registered projects accounted for 0.005 percent, 0.072 percent, and 0.037 percent of the total RE generation in 2018, 2019 and 2020 (through June 2020), respectively.

[63] Based on the low estimate of unit REC cost of US$0.25/REC
[64] Based on the high estimate of unit REC cost of US$2.04/REC
[65] https://tigrsregistry.apx.com/ng/Report/getdto_view_Report_Public_CertificateByYearCtryFT

10.3 Review of RECs services currently provided in Vietnam

Scope of Services

REC registrants or device owners are defined as entities that have legal rights to environmental attributes associated with generation—these are typically the project owners. However, like in the carbon market, given the complexities of REC market trading and the limited capacities of project owners in understanding the standards and procedural requirements, project owners often contract dedicated consultants for the REC services. There are more than 50 firms that participate in REC trading and brokerage, many of which have access to projects and RECs in Vietnam. These consultants provide a variety of services, that include, but are not limited to:

- Compiling the required project documentations
- Advising on and monitoring REC implementation
- Acting as intermediaries between the project owner and the REC buyer

Costs and benefits

In Vietnam, REC service consultants often provide two main service options:

Option 1: The project owner hires consultant for technical and marketing support. In this option, the project owner will contract a consultant to register their electricity generation facilities to the REC tracking system by completing all the administration work (like opening registry account, project registration forms, collecting the electricity generation information, and completing the monitoring and issuance request forms). The consultant may also seek and engage REC buyers to sell the issued RECs from the project. In this model, the project owner will pay for all consultancy (including RECs sales commission fee) and registry fees. However, the owner may find and/or choose the buyer and establish a market price by itself. The expenses for certification of RECs often include:

- Costs for hiring technical consultants to develop projects
- Registration fees (set by the standards managing entity)
- Costs related to monitoring of project
- Issuance fees (set by the standards managing entity)
- Registry fees
- Taxes on RECs
- Commission fee for the broker/consultant (if any).

The cost of each item will vary depending on the location of the project, technology, project scale and the agreement with consultant, auditors, or other partners. The costs mentioned below are estimates gleaned from the Consultant's experience as well as direct interviews with project owners. Table 21 summarizes the average cost of these items for project developers in Vietnam.

Table 21: Project development cost among different REC tracking systems

No	Item	Cost		Note
		IREC[66]	TIGR[67]	
1.	**Registrant Account fee**	EUR 0.00	Micro Generator (<250 kW) - $100	REC tracking system fee
			Small Generator (250 kW – 1 MW) - $200	
			Medium Generator (1-10 MW) - $500	
			Large Generator (10+ MW) - $1,000	
2.	**One-time trade account opening fee**	EUR 500		REC tracking system fee
3.	**Annual trade account fee**	EUR 2000		REC tracking system fee
4.	**Complete application forms**	1,000 – 2,000 USD[68]		Consultancy fee
5.	**Project registration fee**	EUR 1000	N/A	REC tracking system fee
6.	**Completing the monitoring report forms**	1,000 – 2,000 USD [69]		
7.	**REC issuance fee (per MWh)**	EUR 0.025 [70]	$0.03	REC tracking system fee
8.	**Renewal fee**	EUR 400.00	N/A	REC tracking system fee
9.	**Taxes on RECs certificate**	Business income tax		Vietnam corporate tax[71]
10.	**Commission for selling REC credits**	15-40% [72]		

Option 2: Net income to project owner. This option is generally the preferred option for project owners in Vietnam. The services the Consultant provides under this arrangement are the same as Option 1, but the difference is that the project owner will not pay any costs/fees but receiving the net payment from Consultants/Brokers. It is similar to the cooperation model used in most of the CDM projects from 2007-2012, where project owners sign fixed contracts with buyers, brokers, and/or consultants for a fixed or floating price (ranging from 60-75 percent of the spot market price) for the RECs while the Buyers/brokers/consultants bear the certification and issuance costs. In this way, project owners can give themselves more stability and predictability compared to the spot market.

[66] Fee structure has been valid since March 2020 https://www.irecstandard.org/documents/ as presented in Annex 1
[67] TIGR registry service fees effective since September 2018 as presented in Annex 1
[68] Based on experience and on the required workload for the required tasks.
[69] Based on experience and on the required workload for the required tasks.
[70] If the project is also developed under the Goldstandard, the GS labelling fee of 0.1 USD/MWh will be added.
[71] Not like CER carbon tax for CDM project, the Vietnam Government has not yet introduced the specific tax for REC certificate
[72] Depended on the size and type of project.

Currently in Vietnam, hydropower developers can make a deal with buyers/brokers/consultants under I-RECS for a net fixed price of US$0.2 – US$0.3/REC while wind and solar project developers can earn approximately US$0.5 – US$0.8/REC. According to Gia Lai Electricity JSC who has registered a project under TIGR, the expected price is US$0.8/MWh for solar power projects and US$0.35/MWh for hydropower.[73]

10.4 Review of current gaps and barriers in current RECs operations in Vietnam

As previously mentioned, GVN has issued several FIT and other incentive mechanisms to support investment in RE, however, the environmental attributes from generated electricity are not mentioned in any Government decisions or supporting mechanisms. In addition to having no policy framework regulating the RECs market, the market penetration is also exceptionally low due to low awareness of RE project owners. In summary, the major gaps, and barriers to effective and widespread adoption of RECs in Vietnam include:

- Lack of understanding of RECs and their markets and limited capacity among industry participants, including generators, electricity providers, regulators, and consumers.
- Difficulty in accessing the RECs market due to lack of market information and transparency on demands and prices.
- Limited availability for linking with international RECs systems to track and verify REC transactions.
- No legal basis to identify REC ownership. This makes it difficult for buyers to make claims about the environmental benefits of RECs.
- No institutional set-up for tracking generated RECs

No comprehensive national tracking system for different initiatives, such as RECs and GHG, to avoid double counting. Currently, some hydropower, wind, and power projects can be developed as carbon projects to claim carbon credits and obtain additional revenue. Meanwhile, they can also apply for RECs, which may cause double counting. Thus, the relationship between RECs and carbon credits or the integration of different schemes must also be considered. To avoid the regulatory conflicts and risks between different mechanisms, the relevant GVN departments should strengthen inter-departmental communication and design the system with an overarching vision to promote REC issuance and avoid double counting to accelerate RE development and emission reduction.

[73] https://www.geccom.vn/upload/quanhecodong/128/filetitle/20190916%20-%20strengthening%20international%20cooperation%20activities.pdf

Annex 1. Projects in Vietnam Registered with I-RECs

Table 22: Projects in Vietnam Registered with I-RECs[74]

Device ID	Name	Address	COD Date	Registration Date	Capacity (MW)
KHEDIEN1	Khe Dien Hydro	Phuoc Ninh, Nong Son district, Quang Nam province	28/05/2007	01/03/2015	9
IAGRAI01	Ia Grai 1 Hydropower	H'Luh, Plei Cham, Gia Lai Province	08/08/2012	01/10/2015	10.8
THANHTH2	Thanh Thuy Hydro Units 1 and 2	Thanh Thuy Commune, Vi Xuyen District, Ha Giang Province	29/06/2011	01/10/2015	20
PHUMAU01	Phu Mau Hydropower Project	Liem Phu, Van Ban, Lao Cai Province	08/09/2008	01/01/2016	5.6
DAKDOA01	Dak Doa Hydropwer	Dak So Mei Commune, Gia Lai Province	26/03/2011	01/09/2016	14
CHIECONG	Chieng Cong Hydropower	Chieng Cong Commune, Muong La District, Son La Province	09/03/2011	01/01/2017	11.4
NAMPIA01	Nam Pia Hydropower	Chieng Hoa, Muong La, Son La	05/08/2009	01/01/2017	15
NAMSOI01	Nam Soi Hydropower Project	Muong Cai, Song Ma District, Son La	28/05/2010	01/02/2017	10
IAGRAI02	Ia Grai Hydro Project 2	Ia To, Ia Grai District, Gia Lai Province	29/09/2017	01/01/2018	7.5
NAMCONG1	Nam Cong Hydropower	Huoi Mot Commune, Song Ma District, Son La	10/04/2010	01/01/2018	10
DINHBINH	Thuy Dien Dinh Binh	Dinh Nhut, Vinh Thanh district, Dinh Binh province	05/01/2013	01/02/2018	9.9
BACLIEU1	Bac Lieu Windfarm	Bac Lieu	29/05/2013	01/04/2018	99.2
PHULAC01	Phu Lac Windfarm	Tuy Phong, Binh Thuan	08/09/2016	01/04/2018	24
SESAN4AH	Se San 4a Hydro	Ia Grai, Gia Lai	15/07/2011	01/04/2018	63
NAMANHY1	Nam An Hydropower	Tan Thanh, Bac Quang, Ha Giang	04/09/2012	01/06/2018	6
AYUNTRNG	Ayun Trung	Mang Yang District, Gia Lai	01/11/2018	01/11/2018	13
BACNAMH1	Bac Na Mini Hydro	Nam Khanh, Bac Ha District, Lao Cai	22/12/2016	01/01/2019	17
PHUHUS01	BP Solar 1 Power Project	Phuoc Huu Commune, Ninh Phuoc District, Ninh Thuan Province	08/03/2019	01/01/2019	46
DADANG02	Da Dang 2	Tan Thanh, Duc Trong District, Lam Dong	01/09/2010	01/01/2019	34
DAMBRI01	Da M-Bri	Doan Ket, Da Huoui District, Lam Dong	31/12/2013	01/01/2019	75
DASIAT01	Dasiat Hydropower	Loc Bao, Gia Nghia, Lam Dong,	01/01/2010	01/01/2019	13.5
EAKRON01	Ea Krong Rou Hydropower Project	Van Hanh 1, Ninh Hoa, Khanh Hoa Province	17/06/2007	01/01/2019	28
KRONGPA1	Krong Pa - Monsoon Carbon	Chu Gu commune, Krong Pa district, Gia Lai 62114	28/11/2018	01/01/2019	49

[74] https://v-1.evident.app/Public/ReportDevices/ (assessed on 24 Oct 2020)

Device ID	Name	Address	COD Date	Registration Date	Capacity (MW)
NAMMUHY1	Nam Mu Hydropower Project	Nam Xe Commune, Van Ban District, Lao Cai Province	02/12/2012	01/01/2019	10
NAMXAH01	Nam Xa Hydropower Project	Chieng An commune, Muong La District, Son La	05/12/2015	01/01/2019	9.6
NAMXAY02	Nam Xay Noi 2 Hydropower Project	Nam Xay and Nam Xe, Van Ban District, Lao Cai	23/07/2018	01/01/2019	12
SONGLO01	Song Lo 4 Hydropower Project	Tan Thanh Commune, Bac Quang District, Ha Giang Province	12/09/2017	01/01/2019	24
TACOHY01	Ta Co Hydropower Project	Sop Cop Commune, Sop Cop District, Son La Province	01/09/2012	01/01/2019	30
HNGDNGA1	Hang Dong A1 Hydropower Project	Hang Dong, Bac Yen District, Son La	30/01/2013	01/02/2019	8.4
MUONGK01	Muong Kim Hydropower Project	Ho Bon, Mu Cang Chai, Yen Bai	08/09/2010	01/02/2019	13.5
NATAPHY1	Na Tau Hydropower Project	Cai Bo, Quang Uyen District, Cao Bang	01/03/2014	01/02/2019	8
SUOILU03	Suoi Lum 3 Hydropower Project	Pac Nga Commune, Bac Yen District, Son La Province	18/12/2015	01/02/2019	14
HNGDONGA	Hang Dong A Hydropower Project	Ta Sua Commune, Bac Yen District, San Lo Province	25/10/2015	01/04/2019	16
KHMNGHYD	Khao Mang Hydropower Project	Hon Bon, Lao Chai, Khao Mang Commune, Mu Can Chai District, Yen Bai Province	20/01/2017	01/04/2019	30
KHMNGTH1	Khao Mang Thuong Hydropower Project	Kim Noi, Mo De, Lao Chai, Khao Mang Communes, Mu Cang Chai District, Yen Bai Province	27/09/2015	01/04/2019	24.5
MUONKIM2	Muong Kim II Hydropower Project	Ho Bun, Mu Cang Chai District, Yen Bai	26/07/2019	01/04/2019	10.5
SUSAPHY1	Suoi Sap 1 Hydropower Project	Suoi To, Phu Yen District, Son La	16/02/2012	01/04/2019	19.5
AYUNTH1A	Monsoon Ayun Thuong 1A	HNol, Dak Dao District, Gia Lai	11/07/2011	01/06/2019	12
BINTHU02	VSP Binh Thuan II Solar Power Project	Vinh Hao Commune, Tuy Phong District, Binh Thuan Province	01/06/2019	01/06/2019	33
VINHHAO6	Vinh Hao 6 PV Solar Plant	Vinh Hai Hamlet, Vinh Hao Commune, Tuy Phong District, Binh Thuan Province	04/06/2019	18/06/2019	50
PHUHUSOL	Phuoc Huu Solar Project	Hau Sanh Village, Phuoc Huu Commune, Ninh Phuoc District, Ninh Thuan Province	20/06/2019	20/06/2019	50
YENDIN01	Yen Dinh Solar Plant	Yen Thai Commune, Yen Dinh District, Thanh Hoa Province	21/02/2019	20/09/2019	30

Device ID	Name	Address	COD Date	Registration Date	Capacity (MW)
NAMMU2HP	Nam Mu 2 10.2 MW Hydro Power Project	Muong Mun, Tuan Giao District, Dien Bein Province	14/02/2018	01/01/2020	10.2
RAOTRNG4	Rao Trang 4 - 14 MW	Phong Xuan, Phong Dien District, Thua Thien Hue	04/11/2019	01/01/2020	14
SONGBACH	Song Bac Hydropower Project	Tan Trinh, Quang Binh District, Ha Giang Province	14/04/2014	01/01/2020	42
TIENTHNH	Tien Thanh HPP	Xa, Hanh Phuc, Quang Uyen, Cao Bang	31/12/2019	01/01/2020	15
TRAMTAUH	Tram Tau Hydro Power 30MW	Tram Tau District, Yen Bai	26/06/2018	01/01/2020	30

Annex 2. REC tracking system fees schedules

I-REC Fees

A renewable electricity generating facility must be registered with the I-REC system before I-REC standard certificates can be issued. Table 23 shows the I-REC fee structure that has been valid since March 2020.

Table 23. I-REC Fee Structure (2020)

Participant Fees (Trade and redemption accounts)[75]	
One-time trade account opening fee	EUR 500
Annual trade account fee	EUR 2000
Additional redemption account fee	EUR 0.00
Redemption fee (per MWh)	EUR 0.06
Registrant Fees (Central issuer)[76]	
Registrant application and account fee	EUR 0.00
One-time device registration fee (5-year validity)	EUR 1000
Device renewal fee after 5-year validity	EUR 400.00
Issuance fee (per MWh)	EUR 0.025

TIGR Fees

TIGR has two types of fees: subscription and volumetric:

- **Subscription Fee.** Subscriber shall pay an annual Subscription Fee, payable at the time that it registers in the Registry and at each 12-month anniversary of account approval. The Subscription Fee will be based upon the size of any Project registered and the type of Account maintained by Subscriber. If Subscriber registers more than one project, Subscriber will pay a separate Subscription Fee for each project registered.
- **Volumetric Fees.** Subscriber shall pay a monthly Volumetric Fee, which will be determined as follows:
    - **Issuance Fee:** Account Holder shall pay an Issuance Fee for each Certificate issued in the Registry for a project registered by Account Holder.
    - **Transfer Fee:** Account Holder shall pay a Transfer Fee for each Certificate received from other account holders.
    - **Retirement Fee:** Account Holder shall pay a Retirement Fee for each Certificate retired in the Account Holder's retirement sub-account.

All fees are listed in US Dollars ($). Table 24 shows the TIGR fee structure that has been valid since September 2018.

[75] Invoices issued by the International REC Standard
[76] Invoices issued by The Green Certificate Company

Table 24. TIGR Fee Structure

Type	Size	Annual Subscription Fee ($)
Account: **Project**		$0
Account: **General**		$1000
Account: **Retail Aggregator**		$1000
Account: **Retirement**		$250
Account: **Qualified Reporting Entity**		$0
Project: **Micro Generator**	<250 kW	$100
Project: **Small Generator**	250 kWs to <1MW	$200
Project: **Medium Generator**	1 MW to <10MW	$500
Project: **Large Generator**	>10MW	$1000
Volumetric Fees		**Price per TIGR certificate**
Issuance Fee		$0.03/certificate
Transfer Fee		$0.01/certificate (paid by recipient)
Retirement Fee		$0.03/certificate

Annex 3. List of Potential Wind REC Registrants

Table 25. List of Potential Wind REC Registrants

** Data up to June 2019*

No	Name of plant	Owner	Location	Capacity (MW)	COD
1	Phong điện 1 Bình Thuận (giai đoạn 1)	Công ty TNHH MTV Năng lượng Tái tạo Việt Nam	Bình Thuận	30.00	12/09/2009
2	Bạc Liêu	Công ty TNHH Xây dựng - Thương mại – Du Lịch Công Lý	Bạc Liêu	99.20	GĐ 1: 24/8/2013 GĐ 2 29/09/2016
3	Phương Mai (giai đoạn 1)	Công ty Cổ phần Phong điện Phương Mai	Bình Định	30.00	Chưa vận hành
4	Phú Lạc	Công ty CP Phong điện Bình Thuận	Bình Thuận	24.00	11/09/2016
5	Trang trại Phong điện Tây Nguyên GĐ 1	Công ty TNHH Giải Pháp Năng Lượng Gió HBRE	Đắk Lắk	28.80	Đang trong quá trình thí nghiệm và thử nghiệm
6	Mũi Dinh	Công ty TNHH Điện gió Mũi Dinh	Ninh Thuận	37.60	Đang trong quá trình thí nghiệm và thử nghiệm
7	Phong Điện Trung Nam	Công ty CP điện gió Trung Nam	Ninh Thuận	105.75	Đã COD Giai đoạn 1 39.95 MW
8	Thuận Nhiên Phong	Công ty CP Năng lượng tái tạo Châu Á	Bình Thuận	32.00	Chưa vận hành
9	Hướng Linh 2	Công ty CP Tổng Công ty Tân Hoàn Cầu	Quảng Trị	30.00	01/09/2017
10	Đầm Nại	Công ty Cổ phần Điện gió Đầm Nại	Ninh Thuận	39.38	GĐ 1: 08/10/2017 GĐ 2: 13/12/2018
11	Điện gió Khu du lịch Khai Long - Cà Mau GĐ1	Công ty Cổ phần Super Wind Energy Công Lý 1	Cà Mau	100.00	Chưa vận hành
12	Hướng Linh 1	Công ty CP Tổng công ty Tân Hoàn Cầu	Quảng Trị	30.00	Đang trong quá trình thí nghiệm và thử nghiệm
13	Nhà máy điện Gió Công Lý Sóc Trăng - GĐ 1	Công ty Cổ phần Super Wind Energy Công Lý Sóc Trăng.	Sóc Trăng	30.00	Đang trong quá trình thí nghiệm và thử nghiệm
14	Nhà máy điện Gió Phương Mai 3	Công ty Cổ phần Phong điện Miền Trung	Bình Định	21.00	Chưa vận hành
15	Nhà máy điện Gió Bạc Liêu Giai đoạn 3	Công ty Cổ phần Super Wind Energy Công Lý Bạc Liêu	Bạc Liêu	140.60	Chưa vận hành

No	Name of plant	Owner	Location	Capacity (MW)	COD
16	Nhà máy điện gió Hòa Thắng 1.2	Công ty Cổ phần Năng lượng Hòa Thắng	Bình Thuận	100.00	Chưa vận hành
17	Nhà máy điện gió VPL Bến Tre	Công ty Cổ phần Năng lượng VPL	Bến Tre	30.00	Chưa vận hành
18	Nhà máy điện gió Hòa Bình 1, tỉnh Bạc Liêu	Công ty Cổ phần Đầu tư Điện gió Hòa Bình 1	Bạc Liêu	50.00	Chưa vận hành

Annex 4. List of Potential Solar REC Registrants

Table 26. List of Potential Solar REC Registrants

** Data up to June 2019*

#	Project	Capacity (MWp)			Capacity (MW)			Dist.	Province
		Total	Pre-2020	Post-2020	Total	Pre-2020	Post-2020		
1	ĐMT Sao Mai	262.5	130	132.5	210	104	106	Tịnh Biên	An Giang
2	ĐMT Văn Giáo 1	50	50	0	40	40	0	Tịnh Biên	An Giang
3	ĐMT Văn Giáo 2	50	50	0	40	40	0	Tịnh Biên	An Giang
4	Bình Hòa	10	10	0	8	8	0	KCN Bình Hòa	An Giang
5	ĐMT KCN Châu Đức	125	125	0	100	100	0	Châu Đức	Bà Rịa Vũng Tàu
6	ĐMT Hồ Gia Hoét	49.9	49.9	0	39.92	39.92	0	Châu Đức	Bà Rịa Vũng Tàu
7	ĐMT Hồ Tầm Bó	35	35	0	28	28	0	Châu Đức	Bà Rịa Vũng Tàu
8	ĐMT Đá Bạc 3	50	50	0	40	40	0	Châu Đức	Bà Rịa Vũng Tàu
9	ĐMT Đá Bạc 4	50	50	0	40	40	0	Châu Đức	Bà Rịa Vũng Tàu
10	ĐMT Đá Bạc	60	60	0	48	48	0	Châu Đức	Bà Rịa Vũng Tàu
11	ĐMT Đá Bạc 2	60	60	0	48	48	0	Châu Đức	Bà Rịa Vũng Tàu
12	Đầm Trà Ổ	50	50	0	40	40	0	Phù Mỹ	Bình Định
13	ĐMT Phù Mỹ	412.5	287.5	125	330	230	100	Phù Mỹ	Bình Định
14	ĐMT Fujiwara	50	50	0	40	40	0	TP. Quy Nhơn	Bình Định
15	ĐMT Cát Hiệp	49.5	49.5	0	39.6	39.6	0	Phù Cát	Bình Định
16	ĐMT Lộc Ninh	800	750	50	640	600	40	Lộc Ninh	Bình Phước
17	ĐMT Thác Mơ	50	50	0	40	40	0	Phước Long	Bình Phước
18	ĐMT Vĩnh Hảo 6	50	50	0	40	40	0	Tuy Phong	Bình Thuận
19	ĐMT Bình An	50	50	0	40	40	0	Bắc Bình	Bình Thuận
20	ĐMT Phan Lâm 2	49	49	0	39.2	39.2	0	Bắc Bình	Bình Thuận
21	ĐMT Hồng Phong 4	48	48	0	38.4	38.4	0	Bắc Bình	Bình Thuận
22	ĐMT Phan Lâm	36.72	36.72	0	29.376	29.376	0	Bắc Bình	Bình Thuận
23	ĐMT Vĩnh Hảo 4	36	36	0	28.8	28.8	0	Tuy Phong	Bình Thuận
24	ĐMT Sơn Mỹ 3.1	50	50	0	40	40	0	Hàm Tân	Bình Thuận
25	ĐMT Hồng Liêm 6.1	50	50	0	40	40	0	Hàm Thuận Bắc	Bình Thuận

#	Project	Capacity (MWp)			Capacity (MW)			Dist.	Province
		Total	Pre-2020	Post-2020	Total	Pre-2020	Post-2020		
26	ĐMT Hồng Liêm 3	50	50	0	40	40	0	Hàm Thuận Bắc	Bình Thuận
27	ĐMT Thuận Minh 2	50	50	0	40	40	0	Hàm Thuận Bắc	Bình Thuận
28	ĐMT Hồng Phong 5.2	48	48	0	38.4	38.4	0	Bắc Bình	Bình Thuận
29	ĐMT Hàm Kiệm	49	49	0	39.2	39.2	0	Hàm Thuận Nam	Bình Thuận
30	ĐMT Đa Mi	59.375	59.375	0	47.5	47.5		Tánh Linh	Bình Thuận
31	ĐMT Hàm Kiệm 1	46	46	0	36.8	36.8	0	Hàm Thuận Nam	Bình Thuận
32	ĐMT Mũi Né	40	40	0	32	32	0	thành phố Phan Thiết	Bình Thuận
33	ĐMT Eco Seido	50	50	0	40	40		Tuy Phong	Bình Thuận
34	ĐMT Vĩnh Tân 2	42.65	42.65	0	34.12	34.12	0	Tuy Phong	Bình Thuận
35	VSP Bình Thuận II	37.4875	37.4875	0	29.99	29.99		Tuy Phong	Bình Thuận
36	Tuy Phong Bình Thuận	37.5	37.5	0	30	30		Tuy Phong	Bình Thuận
37	ĐMT Sông Lũy	17.5	17.5	0	14	14		Bắc Bình	Bình Thuận
38	ĐMT Sông Lũy 1	48.75	48.75	0	39	39		Bắc Bình	Bình Thuận
39	ĐMT Vĩnh Tân GĐ 1	5	5	0	4	4	0	Tuy Phong	Bình Thuận
40	ĐMT Hồng Phong 1	250	250	0	200	200	0	Bắc Bình	Bình Thuận
41	Sông Bình	250	62.5	187.5	200	50	150	Sông Bình	Bình Thuận
42	ĐMT Hàm Phú 2	49	49	0	39.2	39.2	0	Hàm Thuận Bắc	Bình Thuận
43	ĐMT Phong Phú	42	42	0	33.6	33.6	0	Tuy Phong	Bình Thuận
44	Trang trại điện mặt trời BMT	30	30	0	24	24	0	Krông Pắc	Đắk Lắk
45	ĐMT Srepok 1	50	50	0	40	40	0	Buôn Đôn	Đắk Lắk
46	ĐMT Long Thành 1	50	50	0	40	40	0	Ea Sup	Đắk Lắk
47	ĐMT Quang Minh	50	50	0	40	40	0	Buôn Đôn	Đắk Lắk
48	ĐMT Jang Pông	30	30	0	24	24	0	Buôn Đôn	Đắk Lắk
49	ĐMT Xuân Thiện - EaSup	750	750	0	600	600		Ea Sup	Đắk Lắk
50	ĐMT Cư Jut	62.5	62.5	0	50	50		Cư Jut	Đắk Nông
51	ĐMT Trúc Sơn	44.4	44.4	0	35.52	35.52	0	Cư Jut	Đắk Nông
52	ĐMT Krong Pa	61.25	61.25	0	49	49		Krong Pa	Gia Lai
53	ĐMT Krong Pa 2	49	49	0	39.2	39.2	0	Krong Pa	Gia Lai
54	ĐMT Chư Ngọc	40	15	25	32	12	20	Krông Pa	Gia Lai
55	Cẩm Hòa	50	50	0	40	40	0	Cẩm Xuyên	Hà Tĩnh
56	Cẩm Hưng	29	29	0	23.2	23.2	0	Cẩm Xuyên	Hà Tĩnh
57	Sơn Quang	29	29	0	23.2	23.2	0	Cẩm Xuyên	Hà Tĩnh
58	ĐMT Hậu Giang	36.25	36.25	0	29	29		Phụng Hiệp	Hậu Giang

#	Project	Capacity (MWp)			Capacity (MW)			Dist.	Province
		Total	Pre-2020	Post-2020	Total	Pre-2020	Post-2020		
59	ĐMT KN Vạn Ninh	125	125	0	100	100		Vạn Ninh	Khánh Hòa
60	ĐMT Long Sơn	170	170	0	136	136	0	Ninh Hòa	Khánh Hòa
61	ĐMT Điện lực miền Trung	62.5	62.5	0	50	50		Cam Lâm	Khánh Hòa
62	ĐMT AMI	50	50	0	40	40	0	Cam Lâm	Khánh Hòa
63	ĐMT KN Cam Lâm	50	50	0	40	40	0	Cam Lâm	Khánh Hòa
64	ĐMT Cam Lâm VN	50	50	0	40	40	0	Cam Lâm	Khánh Hòa
65	ĐMT Sông Giang	50	50	0	40	40	0	Cam Ranh	Khánh Hòa
66	ĐMT Trung Sơn	35	35	0	28	28	0	Cam Lâm	Khánh Hòa
67	ĐMT Tuấn Ân	12.5	12.5	0	10	10		Cam Ranh	Khánh Hòa
68	ĐMT Sê San 4	61.25	61.25	0	49	49		Ya H' Drai	Kon Tum
69	ĐMT Europlas, Long An	50	50	0	40	40	0	Đức Huệ	Long An
70	ĐMT TTC Đức Huệ 1	49	49	0	39.2	39.2	0	Đức Huệ	Long An
71	ĐMT BCG Băng Dương	40.6	40.6	0	32.48	32.48	0	Thạnh Hóa	Long An
72	Solar Park 1	50	50	0	40	40	0	Đức Huệ	Long An
73	Solar Park 2	50	50	0	40	40	0	Đức Huệ	Long An
74	Solar Park 3	50	50	0	40	40	0	Đức Huệ	Long An
75	Solar Park 4	50	50	0	40	40	0	Đức Huệ	Long An
76	GAIA	125.625	125.625	0	100.5	100.5	0	Thạnh Hóa	Long An
77	ĐMT Xuân Thiện – Thuận Bắc	250	250	0	200	200	0	Thuận Bắc	Ninh Thuan
78	ĐMT CMX, Ninh Thuận	210	210	0	168	168	0	Ninh Sơn	Ninh Thuan
79	ĐMT Trung Nam	255	255	0	204	204	0	Thuận Bắc	Ninh Thuan
80	Phước Thái	250	250	0	200	200	0	Ninh Phước	Ninh Thuan
81	ĐMT Gelex	50	50	0	40	40	0	Thuận Nam	Ninh Thuan
82	ĐMT Nhị Hà	50	50	0	40	40	0	Thuận Nam	Ninh Thuan
83	ĐMT Adani Phước Minh	49.8	49.8	0	40	40	0	Thuận Nam	Ninh Thuan
84	Hacom Ninh Thuận	50	50	0	40	40	0	Thuận Nam	Ninh Thuan
85	Thuận Nam - Đức Long	50	50	0	40	40	0	Thuận Nam	Ninh Thuan
86	ĐMT Thuận Nam 19	61.25	61.25	0	49	49	0	Thuận Nam	Ninh Thuan
87	ĐMT BIM 2	312.5	312.5	0	250	250	0	Thuận Nam	Ninh Thuan
88	ĐMT hồ Núi Một 1	50	50	0	40	40	0	Thuận Nam	Ninh Thuan
89	Thiên Tân Solar Ninh Thuận	62.5	62.5	0	50	50	0	Bắc Ái	Ninh Thuan
90	ĐMT hồ Bầu Ngứ	62.5	62.5	0	50	50	0	Ninh Phước	Ninh Thuan

#	Project	Capacity (MWp)			Capacity (MW)			Dist.	Province
		Total	Pre-2020	Post-2020	Total	Pre-2020	Post-2020		
91	ĐMT Phước Hữu	62.5	62.5	0	50	50	0	Ninh Phước	Ninh Thuan
92	ĐMT SP Infra 1	50	50	0	40	40	0	Ninh Phước	Ninh Thuan
93	ĐMT Sinenergy	50	50	0	40	40	0	Ninh Phước	Ninh Thuan
94	ĐMT Mỹ Sơn	62.5	62.5	0	50	50	0	Ninh Sơn	Ninh Thuan
95	ĐMT Ninh Phước 6.2	50	50	0	40	40	0	Ninh Phước	Ninh Thuan
96	ĐMT Mỹ Sơn - Hoàn Lộc Việt	50	50	0	40	40	0	Ninh Sơn	Ninh Thuan
97	ĐMT Mỹ Sơn 2	50	50	0	40	40	0	Ninh Sơn	Ninh Thuan
98	ĐMT BIM 3	50	50	0	40	40	0	Thuận Nam	Ninh Thuan
99	ĐMT BP Solar 1	46	46	0	36.8	36.8	0	Ninh Phước	Ninh Thuan
100	ĐMT Phước Ninh	45	45	0	36	36	0	Thuận Nam	Ninh Thuan
101	ĐMT Phước Hữu - Điện lực 1	30	30	0	24	24	0	Ninh Phước	Ninh Thuan
102	ĐMT BIM	30	30	0	24	24	0	Thuận Nam	Ninh Thuan
103	ĐMT Bầu Zôn	25	25	0	20	20	0	Ninh Phước	Ninh Thuan
104	ĐMT Ninh Phước 6.1	8.75	8.75	0	7	7	0	Ninh Phước	Ninh Thuan
105	Solar Farm Nhơn Hải	35	35	0	28	28	0	Ninh Hải	Ninh Thuan
106	Thuận Nam 12	49.9	49.9	0	39.92	39.92	0	Thuận Nam	Ninh Thuan
107	ĐMT Europlas, Phú Yên	50	50	0	40	40	0	Tây Hòa	Phú Yên
108	Thành Long Phú Yên	50	50	0	40	40	0	Tây Hòa	Phú Yên
109	ĐMT Hòa Hội	267.7	267.7	0	214.16	214.16	0	Phú Hòa	Phú Yên
110	ĐMT Xanh Sông Cầu	187.5	187.5	0	150	150	0	TX. Sông Cầu	Phú Yên
111	ĐMT Thịnh Long AAA	50	50	0	40	40	0	Tây Hòa	Phú Yên
112	ĐMT Xuân Thọ 1	49.608	49.608	0	39.7	39.7	0	TX. Sông Cầu	Phú Yên
113	ĐMT Xuân Thọ 2	49.608	49.608	0	39.7	39.7	0	TX. Sông Cầu	Phú Yên
114	ĐMT Dohwa Lệ Thủy	49.5	49.5	0	39.6	39.6	0	Lệ Thủy	Quảng Bình
115	ĐMT Bình Nguyên	49.608	49.608	0	0	0	0	Bình Nguyên	Quảng Ngãi
116	ĐMT Mộ Đức	24	24	0	19.2	19.2	0	Mộ Đức	Quảng Ngãi
117	ĐMT LIG Quảng Trị	49.5	49.5	0	39.6	39.6	0	Gio Linh	Quảng Trị
118	ĐMT Gio Thành 1	50	50	0	40	40	0	Gio Linh	Quảng Trị

#	Project	Capacity (MWp)			Capacity (MW)			Dist.	Province
		Total	Pre-2020	Post-2020	Total	Pre-2020	Post-2020		
119	ĐMT Gio Thành 2	50	50	0	40	40	0	Gio Linh	Quảng Trị
120	ĐMT Mai Sơn	10	10	0	8	8	0	Mai Sơn	Sơn La
121	ĐMT vùng hồ Dầu Tiếng	2500	625	1875	2000	500	1500	Dương Minh Châu và Tân Châu	Tây Ninh
122	ĐMT Tân Châu 1	50	50	0	40	40	0	Tân Châu	Tây Ninh
123	ĐMT Hoàng Thái Gia	50	50	0	40	40	0	Bến Cầu	Tây Ninh
124	ĐMT HCG Tây Ninh	50	50	0	40	40	0	Bến Cầu	Tây Ninh
125	Bách khoa Á Châu 1	30	30	0	24	24	0	Tân Châu	Tây Ninh
126	Trí Việt 1	30	30	0	24	24	0	Tân Châu	Tây Ninh
127	ĐMT TTC số 1	60	60	0	48	48	0	Trảng Bàng	Tây Ninh
128	ĐMT TTC số 2	50	50	0	40	40	0	Trảng Bàng	Tây Ninh
129	ĐMT Ngọc Lặc	45	45	0	36	36	0	Ngọc Lặc	Thanh Hóa
130	ĐMT Yên Định	30	30	0	24	24	0	Yên Định	Thanh Hóa
131	Thanh Hóa 1	160	160	0	128	128	0		Thanh Hóa
132	ĐMT Phong Điền II	50	50	0	40	40	0	Phong Điền	Thừa Thiên Huế
133	ĐMT Phong Điền	43.75	43.75	0	35	35	0	Phong Điền	Thừa Thiên Huế
134	ĐMT Trung Nam Trà Vinh	165	165	0	132	132	0	thị xã Duyên Hải	Trà Vinh
135	ĐMT VNECO Vĩnh Long	49.3	49.3	0	39.44	39.44	0	Vũng Liêm	Trà Vinh

Annex 5. List of Potential Hydro REC Registrants

List of CDM project with capacity equal or less than 30 MW[77]

Table 27. List of Potential Hydro REC Registrants

Ref.	Title	Province/State	MW_{el}
5591	Ho Nui Coc Hydropower Project, Vietnam	Thai Nguyen	1.9
435	Song Muc Hydro Power Station Regeneration Project in Vietnam	Thanh Hoa	2.0
4392	Dak Hnol Hydropower Project.	Gia Lai	2.1
5273	Nam Chanh Hydropower Project	Son La	2.1
	Mien Doi Hydropower Project	Hoa Binh	2.2
2371	Muong Sang hydropower project	Son La	2.4
3514	Pa Khoang hydropower project	Dien Bien	2.4
5949	Dakrosa2 Hydropower Project	Kon Tum	2.4
5615	Suoi Trang Hydropower Plant, Vietnam	Hoa Binh	2.7
4626	La La Hydropower Project, Vietnam	Quang Tri	3.0
5337	Ea Kar Hydropower Plant, Vietnam	Dak Lak	3.0
5579	Nam Cat Hydropower Plant, Vietnam	Bac Kan	3.2
2891	Ta Niet Hydro Power Project	Son La	3.6
5967	Lang Bang Hydropower Project	Yen Bai	3.6
4955	Dak Me 1 Hydropower Project in Vietnam	Lam Dong	4.0
8902	Suoi Choang Hydro Power Project	Nghe An	4.0
5338	Khe Giong Hydropower Plant, Vietnam	Quang Tri	4.5
3552	Dak Rung 1 Hydropower Project	Dak Nong	5.0
5970	Nam Cat Hydropower Project	Lai Chau	5.0
7898	Quang Tin Hydropower Project, Vietnam	Dak Nong	5.0
8169	Khau Chu Hydropower Project	Yen Bai	5.0
2368	Suoi Tan hydropower project	Son La	5.5
2367	Phu Mau hydropower project	Lao Cai	5.6
7586	Hoa Tham Hydropower Project	Cao Bang	5.8
5432	Nam An Hydropower Project	Ha Giang	6.0
8278	6 MW Eatul 4 Hydro Power Project	Dak Lak	6.0
3255	Ha Rao Quan Hydropower Project	Quang Tri	6.4
3589	Ea Drang 2 Hydropower Project	Dak Lak	6.4

[77] Source: http://cdm.unfccc.int

Ref.	Title	Province/State	MW_{el}
	Dak Nir Hydropower Project	Dak Nong	6.5
4755	Ia Puch 3 Hydropower Project	Gia Lai	6.6
6589	Nam Dong 4 Hydro Power Project	Yen Bai	6.8
7063	Khanh Khe Hydro Power Project	Lang Son	7.0
8860	Song Cho 2 Hydro Power Project	Khanh Hoa	7.0
3810	Tra Linh 3 Hydropower Project	Quang Nam	7.2
6937	A Roang Hydropower Project	Thua Thien-Hue	7.2
3256	Coc Dam Hydropower Project	Lao Cai	7.5
5601	Ta Loi 3 Hydropower Project	Lao Cai	7.5
6583	Dak Mek 3 Hydropower Project	Kon Tum	7.5
10097	Dak Pring Hydropower Project	Quang Nam	7.5
	Khe Nghi Hydropower Project.	Quang Tri	8.0
3505	Dak Rung Hydropower Project	Dak Nong	8.0
6050	Dakrong 3 Hydropower Project	Quang Tri	8.0
6738	To Buong Hydropower Plant, Vietnam	Son La	8.0
7193	Nam Hoa 2 Hydro Power Project	Son La	8.0
7616	Nam Khoa 1&2 Hydropower Project	Lao Cai	8.0
8200	Dong Ngai Hydropower Project	Yen Bai	8.0
8309	Nam Cong 3 Hydropower Project	Son La	8.0
3484	Dak Ne Hydropower Project	Kon Tum	8.1
4117	Song Ong Hydropower Project	Ninh Thuan	8.1
7069	Ia H'Rung and Chu Prong Hydropower Project	Gia Lai	8.3
3557	Ngoi Hut 1 Hydropower Project	Yen Bai	8.4
2372	So Lo hydropower project	Hoa Binh	8.7
3980	Da Den Hydropower Project	Phu Yen	9.0
6397	Ha Tay Hydropower Project	Gia Lai	9.0
6556	Dam B'ri 1 Hydropower Project	Lam Dong	9.0
6682	Dong Chum 2 Hydro Power Project	Hoa Binh	9.2
8753	Nam Pung Hydropower Project	Lao Cai	9.3
	Nam Ma & Nam Lung Hydropower Bundled Project	Lai Chau & Lao Cai	9.6
4829	Nam Trai 4 Hydropower Project	Son La	9.6
7509	Nam Xa Hydropower Project	Son La	9.6
	Dam Bol-Da Teh Hydropower Project	Lam Dong	9.6
3682	Nam Tang and Na Hau Hydropower Bundled Projects	Yen Bai	10.0
3942	Dak N'Teng Hydropower Project	Dak Nong	10.0
4656	Dak Psi 5 Hydropower Project	Kon Tum	10.0
5248	Song Nhiem 3 Hydropower Project	Ha Giang	10.0

Ref.	Title	Province/State	MW_{el}
6012	Nam Mo 3 Hydro Power Project, Vietnam	Lai Chau	10.0
8813	Chieng Ngam Thuong hydro-power	Son La	10.0
7956	Dak Srong 3A Hydropower Project	Gia Lai	10.2
	Dak Ne and Dak Pia 10.3 MW Small-scale Hydropower Bundled Project	Kon Tum	10.3
6847	Pao Cu Sang Hydropower Plant, Vietnam	Son La	10.5
8396	Ta Loi 2 Hydro Power Project	Lao Cai	10.5
	Ngoi Duong Hydro Power Project	Lao Cai	10.8
5524	Nam Nua Hydropower Project	Dien Bien	10.8
5793	Ia Grai 1 Hydropower Project	Gia Lai	10.8
	Yen Thang Hydropower Plant Project	Nghe An	11.0
4417	Ha Nang hydropower project	Quang Ngai	11.0
6789	Dak Glun 2 and 3 Hydropower Plants, Vietnam	Dak Nong	11.0
8017	Ban Nhung Small Hydropower Project	Lang Son	11.0
	Ngoi Duong Hydro Power Project	Lao Cai	11.4
6587	Muong Sang, Thu Cuc, Tat Ngoang Hydropower Project	Son La	11.6
3457	Chieng Cong Hydropower Project	Son La	11.7
3421	Song Quang hydropower project	Nghe An	12.0
5030	Nam Khanh Hydropower Project	Lao Cai	12.0
5376	Ayun Thuong 1A Hydropower Project	Gia Lai	12.0
5420	Nam Xay Noi 2 Hydropower Project	Lao Cai	12.0
6393	Trung Ho & Van Ho Hydropower Project	Lao Cai	12.9
	Ia Tchom 1 and Ia Krel 2 Hydropower Bundled Project	Gia Lai	13.0
	Dasiat Hydro Power Project	Lam Dong	13.5
3858	Nam Ngan Hydropower Project	Hau Giang	13.5
3908	Dasiat Hydropower Project	Lam Dong	13.5
5183	Lao Cai-Yen Bai Bundled Hydropower Project	Lao Cai & Yen Bai	13.5
4279	Lao Cai - Lai Chau - Kontum Bundled Hydropower Project	Lai Chau & Lao Cai & Kon Tum	13.8
6716	Nam Cau 1,2 Hydropower Project	Lai Chau	13.8
	Dak Pokei and Ia Grang 1 Hydropower Bundled Project	Gia Lai	14.0
3034	Nam Khot Hydropower Project	Son La	14.0
3530	Suoi Sap 3 Hydro Power Project in Son La Province	Son La	14.0
4384	Dak Doa Hydropower Project.	Gia Lai	14.0
6790	Bao Nhai Hydropower Project, Vietnam	Lao Cai	14.0
6800	Nam Tha 3 Hydropower Project	Lao Cai	14.0
4156	Nam Mu & Khuoi Luong Hydropower Bundled project	Lao Cai & Cao Bang	14.4
3944	Dak Nong 2 Hydropower Project	Dak Nong	14.6

Ref.	Title	Province/State	MW_{el}
	Nam Pia Hydropower Project	Son La	15.0
2627	Nam Pia Hydropower Project	Son La	15.0
3667	La Hieng 2 Hydropower Project	Phu Yen	15.0
4714	Doc Cay Hydropower Project	Thanh Hoa	15.0
6358	Xoong Con Hydropower Project	Nghe An	15.0
8720	Nam He Hydropower Project	Dien Bien	15.0
2878	An Diem 2 Hydropower Project	Quang Nam	15.6
4550	Dak Pone Hydropower Project	Kon Tum	15.6
8296	Nam Si Luong 4 Hydropower Project	Lai Chau	15.6
	Nam Chim Hydro Power Project	Son La	16.0
5164	Nam Hong Hydropower Project	Son La	16.0
5189	Song Chay 5 Hydropower project.	Ha Giang	16.0
5310	Nam Chim Hydro Power Project	Son La	16.0
5902	Nam Mo Hydropower Project	Nghe An	16.0
8154	Song Luy Hydropower Project	Binh Thuan	16.0
4765	H'Mun Hydropower Project	Gia Lai	16.2
8254	Nam Si Luong 3 Hydropower Project	Lai Chau	17.4
	Dak Psi Hydropower Project	Kon Tum	18.0
	Daksrong Hydro Power Project	Gia Lai	18.0
2978	Nam Khoa 3 hydropower project	Lao Cai	18.0
3396	Chau Thon Hydropower Project	Nghe An	18.0
3954	Ho Bon Hydropower Project	Yen Bai	18.0
4210	Dak Srong 2A Hydropower Project	Gia Lai	18.0
4236	Ban Coc Hydropower Project	Nghe An	18.0
4338	Thanh Thuy Hydropower project	Ha Giang	18.0
5056	Dak Mi 4c Hydropower Project, Vietnam	Quang Nam	18.0
7064	Son Tay Hydropower Project	Quang Ngai	18.0
7554	Dak Glun Hydro Power Project	Binh Phuoc	18.0
7691	Ban Ra Hydropower Project	Cao Bang	18.0
8054	DaKrong 2 Hydropower Project	Quang Tri	18.0
8418	Xim Vang 2 Hydroelectric Power Plant	Son La	18.0
4577	Ngoi Xan Hydropower Project	Lao Cai	18.6
3051	Yan Tann Sien Hydropower Project	Lam Dong	19.5
3532	Song Chung Hydropower Project	Ha Giang	19.5
4259	Group of Nam Tha Hydropower Projects	Lao Cai	19.5
5631	Dak Srong 3B Hydropower Project.	Gia Lai	19.5
7848	Thien Nam Hydropower Project	Lai Chau	19.6

Ref.	Title	Province/State	MW_{el}
	Suoi Lum 1 hydroelectric power plant	Son La	20.0
2971	Nam Gion Hydropower Project	Son La	20.0
4544	Nam Soi & Nam Cong Hydropower Project	Son La	20.0
5973	Nam Non Hydropower Project	Nghe An	20.0
6103	Tra Xom Hydropower Project	Binh Dinh	20.0
6203	Song Mien 5 Hydropower Project	Ha Giang	20.0
6439	Thac Xang Hydropower Project	Lang Son	20.0
7028	Suoi Lum 1 hydroelectric power plant	Son La	20.0
7389	Nam Can 2 Hydropower Project	Nghe An	20.0
6736	Sap Viet Hydropower Plant, Vietnam	Son La	21.0
7672	Dak Rong 4 Hydropower Project	Quang Tri	21.0
6574	Dak Lo Hydropower Project	Kon Tum	22.0
9066	Seo Chong Ho Hydropower Project	Lao Cai	22.0
4991	Minh Luong Hydro Power Project	Lao Cai	22.5
8803	Da Dang-Dachomo Hydropower Project	Lam Dong	23.0
3389	Dak Srong 2 Hydropower Project	Gia Lai	24.0
6446	Nam Luc Hydro Power project	Lao Cai	24.0
	Bao Loc Hydropower Plant Project	Lam Dong	24.5
5261	Nam La Hydro Electric Power Project, Vietnam	Son La	27.0
5533	Dak Sin 1 Hydropower Project	Dak Nong	27.0
	Za Hung Hydro Power Project	Quang Nam	28.0
4703	Vinh Son 5 Hydropower Project	Binh Dinh	28.0
5727	Song Bung 6 Hydropower Project	Quang Nam	29.0
	Song Giang 2 Hydro Power Project	Khanh Hoa	30.0
4551	Za Hung Hydropower Project	Quang Nam	30.0
5573	Nam Pong Hydropower Project	Nghe An	30.0
5811	Ta Co hydroelectric power plant	Son La	30.0
6729	Vinh Son 3 Hydro Power Project	Binh Dinh	30.0
7450	Tram Tau Hydroelectric Power Plant	Yen Bai	30.0

Annex 6. List of Potential biomass, waste and biogas REC Registrants[78]

Table 28. List of Potential Solar Biomass, Waste and Biogas REC Registrants

Ref.	Title	Province/ State	Type	MWel
	Anaerobic wastewater treatment and energy recovery project at rubber producing company in Vietnam	Ba Ria-Vung Tau	Methane avoidance	0.5
	Thanh Vu Tay Ninh Wastewater Treatment and Methane Recovery Project	Tay Ninh	Methane avoidance	1.0
	Wastewater Treatment and energy generation Project at Thanh Vu starch factory in Dak Lak province,Viet Nam	Dak Lak	Methane avoidance	2.0
5105	Waste to Energy Project of SURE VN in Binh Duong Province, Viet Nam	Binh Duong	Methane avoidance	2.0
5907	Dinh Hai rice husk cogeneration project	Can Tho	Biomass energy	2.0
1913	Phuoc Hiep I sanitary Landfill gas CDM project in Ho Chi Minh City	Ho Chi Minh	Landfill gas	3.0
9369	Biogas recovery and utilization at Tung Lam Ethanol Factory	Dong Nai	Methane avoidance	3.0
	VEYU tapioca starch wastewater biogas extraction and utilization project, Gia Lai Province, Socialist Republic of Viet Nam	Gia Lai	Methane avoidance	3.8
1910	Dong Thanh Landfill gas CDM Project in Ho Chi Minh City	Ho Chi Minh	Landfill gas	4.3
3733	Landfill gas recovery and utilization in Nam Son, Tay Mo landfills in Hanoi	Ha noi	Landfill gas	5.0
	Biomass Power Project of Soc Trang Sugar Corporation	Soc Trang	Biomass energy	6.0
5364	Wastewater Treatment and Methane Recovery at Green Field Joint Stock Company	Quang Nam	Methane avoidance	6.0
8874	Methane Recovery and Utilization Project of Petrovietnam Biofuels Joint Stock Company	Phu Tho	Methane avoidance	6.3
7721	Methane Recovery and Utilization Project of Petrovietnam Central Biofuels Joint Stock Company	Quang Ngai	Methane avoidance	6.5
	Lap Vo Rice Husk Biomass Power Plant	Dong Thap	Biomass energy	10.0
3482	Lap Vo Rice Husk Biomass Power Plant	Dong Thap	Biomass energy	10.0
9253	Gas Collection, Incineration and Electricity Generation System at Da Phuoc Integrated Waste Management Facility	Ho Chi Minh	Landfill gas	11.3
8444	Biomass Power Project of Gia Lai Cane Sugar and Thermoelectricity Joint Stock Company	Gia Lai	Biomass energy	12.0
	Bagasse cogeneration project at Lam Son Sugar JSC	Thanh Hoa	Biomass energy	12.5
	Bagasse cogeneration project at Lam Son Sugar JSC	Thanh Hoa	Biomass energy	12.5

[78] Source: http://cdm.unfccc.int

7070	Bagasse cogeneration project at Lam Son Sugar JSC	Thanh Hoa	Biomass energy	12.5
	Electricity generation from bagasse at KSC, Vietnam	Khanh Hoa	Biomass energy	15.0

Annex 7. Avoided Cost Tariff for small hydro power projects in year 2020[79]

Table 29. Avoided Cost Tariff for small hydro power projects in year 2020

Energy tariff (VND/kWh)	Dry Season			Wet season			
	Peak	Normal	Off-peak	Peak	Normal	Off-peak	Surplus
For the North	726	726	725	703	704	702	351
For the Centre	729	729	729	707	708	706	353
For the South	749	749	748	727	727	726	363
Capacity tariff (d/kWh) (for all three regions)	1932						

[79] https://luatvietnam.vn/thue/quyet-dinh-4036-qd-bct-bieu-gia-chi-phi-tranh-duoc-nam-2020-180634-d1.html