CDP Technical Note: Accounting of Scope 2 emissions

CDP Climate Change Questionnaire

Contents

Version

Version	Revision date	Revision summary
1.0	February 8, 2013	First published version.
2.0	February 8, 2015	Updated to take in account new GHG Protocol Scope 2 Guidance and other necessary updates.
3.0	February 18, 2016	Updated to align with the 2016 CDP climate change questionnaire
4.0	March 21, 2017	Minor updates to align with the 2017 CDP climate change questionnaire.
5.0	June 7, 2018	Minor updates to align with the 2018 CDP climate change questionnaire.
6.0	March 12, 2019	Minor updates including: • New countries adherent to the International REC Standard (I-REC Standard) and Tradable Instruments for Global Renewables (TIGR Registry) (Section 3) • New clarification on market-based approach (Section 1)
7.0	April 03, 2020	Updated to align with the 2020 CDP climate change questionnaire including: • Revised structure of the document • Updated Glossary: “low-carbon energy”, “RE100” added • New definition of the market boundary criteria for claiming renewable electricity use (Chapter 2.3) • New countries adherent to the International REC Standard (I-REC Standard) • New information about Taiwan and Japan certificate systems
7.1	July 03, 2020	Chapter 2.3 is updated with information on exemption for renewable energy sourcing contracts signed before 31st December 2021
8.0	April 12, 2021	Updated to align with the 2021 CDP climate change questionnaire including: • Revised definitions of green electricity/power, TIGRs and International REC • Guidance added on questions companies can provide additional information for • European residual mix figure source updated to AIB • Revised guidance on the use of REGOs in the UK following Brexit • Revised guidance to clarify the use of green gas certificates

About this document

This technical note has the objective of explaining how to report Scope 2 emissions to CDP in line with the updated 2015 version of the GHG Protocol Scope 2 Guidance – An amendment to the GHG Protocol Corporate Standard. The intended reader of this document is anyone looking to understand how to report their Scope 2 emissions to CDP in the current disclosure cycle.

CDP has a number of accredited solutions providers with experience and expertise both in helping companies account for their Scope 2 emissions (see our consultancy partners here), and reducing emissions through the purchase of renewable energy or other methods. For more information please contact partnerships@cdp.net.

If you have any questions, comments or suggestions about the content of this document please contact CDP at respond@cdp.net.

Glossary

This terminology was partially sourced from the GHGa Protocol Scope 2 Guidance – An amendment to the GHG Protocol Corporate Standard published in January 2015.

Activity data	A quantitative measure of a level of activity that results in GHG emissions. Activity data is multiplied by an emissions factor to derive the GHG emissions associated with a process or an operation. Examples of activity data include kilowatt-hours of electricity used, quantity of fuel used, output of a process, hours equipment is operated, distance traveled, and floor area of a building.
Additionality	A criterion often applied to GHG project activities, stipulating that project-based GHG reductions should only be quantified if the project activity "would not have happened anyway" – i.e., that the project activity (or the same technologies or practices that it employs) would not have been implemented in its baseline scenario.
Attribute	Descriptive or performance characteristics of a particular generation resource. For Scope 2 GHG accounting, the GHG emission rate attribute of the energy generation is required to be included in a contractual instrument in order to make a claim.
Certificate	See energy attribute certificate.
Contractual instrument	Any type of contract between two parties for the sale and purchase of energy bundled with attributes about the energy generation, or for unbundled attribute claims. Markets differ as to what contractual instruments are commonly available or used by companies to purchase energy or claim specific attributes about it, but they can include energy attribute certificates (RECs, GOs, etc.), direct contracts (for low-carbon, renewable, or fossil fuel generation), supplier-specific emission rates, and other default emission factors representing the untracked or unclaimed energy and emissions (termed the residual mix) if a company does not have other contractual information that meets the Scope 2 quality criteria.
Double counting	Two or more reporting companies claiming the same emissions or reductions in the same Scope, or a single company reporting the same emissions in multiple Scopes.
Emission factor	A factor that converts activity data into GHG emissions data (e.g., kg CO_2e emitted per liter of fuel consumed, kg CO_2e emitted per kilometer traveled, etc.).
Emissions	The release of greenhouse gases into the atmosphere.
Energy	Formally, energy is defined as the amount of work a physical system can do on another. In this guidance, energy refers to electrical energy generated by power plants and delivered to energy users over a power grid, or from a third party owned onsite power plant or offsite power plant through a dedicated power transmission line.
Energy attribute certificate	A category of contractual instruments used in the energy sector to convey information about energy generation to other entities involved in the sale, distribution, consumption, or regulation of electricity. This category includes instruments that may go by several different names, including certificates, tags, credits, etc.
Fuel mix disclosure	A report by energy suppliers to their consumers disclosing the generation resources and associated attributes (such as GHG emissions and nuclear waste quantities) provided by that supplier. Disclosure laws often aim to enable informed customer choice in deregulated or liberalized markets

Generation	The electrical energy produced by a power plant or project activity.
Green electricity/power	A generic term for renewable energy sources and specific clean energy technologies that emit fewer GHG emissions relative to other sources of energy that supply the electric grid. Includes solar photovoltaic panels, solar thermal energy, geothermal energy, landfill gas, hydropower, and wind turbines. Resources included in a given certification, reporting, or recognition program may vary.
Green power product/ Green tariff	A consumer option offered by an energy supplier distinct from the "standard" offering. These are often renewables or other low-carbon energy sources, supported by energy attribute certificates or other contracts.
Greenhouse gas (GHG) inventory	A quantified list of an organization's GHG emissions and sources.
Greenhouse gases (GHG)	For the purposes of this standard, GHGs are the seven gases covered by the UNFCCC: carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).
Guarantee of Origin (GO)	A type of energy attribute certificate used in Europe.
Grid	A system of power transmission and distribution (T&D) lines under the control of a coordinating entity or "grid operator," which transfers electrical energy generated by power plants to energy users – also called a "power grid." The boundaries of a power grid are determined by technical, economic, and regulatory-jurisdictional factors.
Indirect GHG emissions	Emissions that are a consequence of the operations of the reporting company but occur at sources owned or controlled by another company. This includes Scope 2 and Scope 3.
International REC (I-REC)	A type of energy attribute certificate intended for regions without an existing or reliable energy attribute tracking, currently limited to locations outside the US, EU/EEA, UK or Australia.
Location-based method	A method to quantify Scope 2 GHG emissions based on average energy generation emission factors for defined locations, including local, subnational, or national boundaries.
Low-Carbon Energy	In line with the IEA definition, low-carbon technologies are technologies that produce low – or zero – greenhouse-gas emissions while operating. In the power sector this includes fossil-fuel plants fitted with carbon capture and storage, nuclear plants and renewable-based generation technologies. Natural gas, combined cycle gas turbine and fossil fuel-based combined heat and power (cogeneration), despite being less carbon intensive than other means of electricity production like coal, are not considered low-carbon.
Market-based method	A method to quantify Scope 2 GHG emissions based on GHG emissions emitted by the generators from which the reporter contractually purchases electricity bundled with instruments, or unbundled instruments on their own.
Megawatt (MW)	A unit of electrical power. One megawatt of power output is equivalent to the transfer of one million joules of electrical energy per second to the grid.
Megawatt-hour (MWh)	A unit of electrical energy equal to 3.6 billion joules; the amount of energy produced over one hour by a power plant with an output of 1 MW.
Offset credits (offsets)	Offset credits (also called offsets, or verified emission reductions) represent the reduction, removal, or avoidance of GHG emissions from a specific project that is used to compensate for GHG emissions occurring elsewhere, for example to meet a voluntary or

	mandatory GHG target or cap. Offsets are calculated relative to a baseline that represents a hypothetical scenario for what emissions would have been in the absence of the mitigation project that generates the offsets. To avoid double counting, the reduction giving rise to the offset must occur at sources or sinks not included in the target or cap for which it is used.
On-site generation	Electricity generated by a generation facility located where some or all of the energy is used. If the generation facility is owned and operated by the consuming company, it can be called "self-generation." On-site generation is a form of distributed energy generation.
Renewable energy	Energy taken from sources that are inexhaustible, e.g. wind, water, solar, geothermal energy, and biofuels.
Renewable Energy Certificate (REC)	A type of energy attribute certificate used in Australia, Canada, India and the USA.
Residual mix	The mix of energy generation resources and associated attributes such as GHG emissions in a defined geographic boundary left after contractual instruments have been claimed/retired/canceled. The residual mix can provide an emission factor for companies without contractual instruments to use in a market-based method calculation.
RE100	RE100 is a global corporate leadership initiative bringing together influential businesses committed to 100% renewable electricity. Led by The Climate Group in partnership with CDP, RE100's purpose is to accelerate change towards zero carbon grids, at global scale. The initiative works to increase corporate demand for – and in turn supply of – renewable energy
Scope 1 emissions	Emissions from operations that are owned or controlled by the reporting company.
Scope 2 emissions	Indirect emissions from the generation of purchased or acquired electricity, steam, heat or cooling consumed by the reporting company.
Scope 2 quality criteria	A set of requirements that contractual instruments shall meet in order to be used in the market-based method for Scope 2 accounting.
Scope 3 emissions	All indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.
Supplier	An entity that provides or sells products to another entity (i.e., a customer). For this guidance, refers to electricity supplier.
Supplier-specific emission factor	An emission rate provided by an electricity supplier to its customers, reflecting the emissions associated with the energy it provides. Suppliers offering differentiated products (e.g. a renewable energy product) should provide specific emission rates for each product and ensure they are not double counted with standard power offers.
Tracking system	A database or registry that helps execute energy attribute certificate issuance and cancellation/retirement/claims between account holders in the system. It can track information on certificates or generation occurring throughout the defined system. They are typically tied to geopolitical or grid operational boundaries.

Tradable Instruments for Global Renewables (TIGRs)	A type of energy attribute certificate intended for regions without an existing or reliable energy attribute tracking, currently limited to locations outside the North America.
Unbundled	An energy attribute certificate or other instrument that is separate, and may be traded separately, from the underlying energy produced.
Vintage	The date that electric generation occurs and/or was measured, from which an energy attribute certificate is issued. This should be distinguished from an energy facility's age (e.g. date that a generating unit commenced operation).

1. Introduction to Scope 2 emissions accounting

1.1 Definitions

The GHG Protocol Corporate Standard (p.33) divides a company's GHG emissions inventory into direct and indirect emissions:

- **Direct emissions** are emissions from sources that are owned and controlled by the reporting company. These emissions are considered **Scope 1**.

- **Indirect emissions** are emissions that are a consequence of the activities of the reporting company, but occur at sources owned or controlled by another company. These include **Scope 2** and **Scope 3** emissions.
  - **Scope 2** includes emissions from energy purchased or acquired and consumed by the reporting company.
  - **Scope 3** emissions include upstream and downstream value chain emissions and are an optional reporting category in the Corporate Standard.

This document focuses on accounting and reporting Scope 2 emissions to CDP. Companies should refer to the complete definition of Scope 2 in Chapter 5 of the GHG Protocol Scope 2 Guidance.

The accounting approach recommended by the GHG Protocol has two important consequences:

- Emission reductions are presented and calculated by comparing changes in a company's GHG inventory over time relative to a base year; and
- Emissions reduction in a corporate GHG inventory does not always reflect physical emissions reduction, specifically in the case of indirect emissions (Scope 2 and Scope 3)[1].

1.2 Scope 2 calculation: the emission rate approach

Calculating Scope 2 emissions requires "allocating" the GHG emissions created by electricity generation to the end consumers of a given grid. Scope 2 allocation is calculated using emission factors applied to units of energy consumption (activity data).

This "emission rate" approach uses the following calculation:

Emissions [tCO_2e] = Activity data [MWh] * Emission factor [tCO_2e/MWh]

Where:

- Activity data is the amount of electricity purchased and consumed in megawatt-hours (MWh). This value will generally be directly measured, specified in purchase contracts or estimated;
- Emission factor represents an average value, for a given period of time, of emissions per MWh, for either a specific grid, supplier or energy generation source. The emission factors reflect emissions assessed at the point of energy generation and do not include T&D losses or upstream lifecycle emissions associated with the technology or fuel used in generation.

Renewable energy purchases in Scope 2 GHG inventories shall be calculated using an emission factors approach[2] and should not be treated as "avoided emissions"[3]. The emission factor has to

[1] "Reductions in indirect emissions (changes in Scope 2 or 3 emissions over time) may not always capture the actual emissions reduction accurately. This is because there is not always a direct cause-effect relationship between the activity of the reporting company and the resulting GHG emissions."
[2] An attributional accounting is practiced when calculating emissions per average unit of production, such as with grid electricity emission factors. When a grid average emission factor is used for a calculation of a Scope 2 figure, one is using an attribution rule that allocates emissions proportionally to physical consumption.
[3] Working in practice as a "Scope 2 offset". Please see [1] for more information.

be chosen carefully as it can completely change the level of emissions calculated. There are two main methods of calculating Scope 2 emissions, the location-based method and the market-based method, and for each of them several emissions factors can be used (see section 3.2 on the choice of emission factors for each method).

1.3 Location-based and market-based Scope 2 accounting

Historically, companies, programs and policy makers have used two main methods for accounting Scope 2 emissions: a **location-based method** and a **market-based method**. These methods differ in respect to the choice of emissions factor used for the allocation. Both methods, further defined below, are recognized by the GHG Protocol, and for reporting Scope 2 emissions in CDP climate change questionnaire.

The location-based method

The **location-based method** reflects the average emissions intensity of grids on which energy consumption occurs. This method applies to all locations where grids are used for the distribution of energy, where electricity demand causes the need for energy generation and distribution. The location-based method follows the basic allocation approach (section 1.2) and uses mostly grid-average emission factors that are based on statistical emissions information and electricity output aggregated and averaged within a defined geographic boundary and a defined time frame. This includes regional/subnational grid averages and national production grid averages.

Note: Additional reporting recommendations and sources of grid-average emission factor data useful for reporting to CDP are covered in the next chapters.

The market-based method

The **market-based method** reflects emissions from the electricity that companies have chosen in the market or their lack of choice. Under this method of Scope 2 accounting, an energy consumer uses the GHG emission factor associated with the qualifying contractual instruments it owns. Markets differ as to what contractual instruments are commonly available or used by companies to purchase energy or claim its specific attributes, but can include:

- Energy Attribute Certificates (RECs, GOs, I-REC, etc.);
- Power Purchase Agreements (PPAs) with energy generators (for both low-carbon, renewable, or fossil fuel-based energy); and
- Green electricity products from energy suppliers.

This method can only be used in and is required for locations where the type of contracts, instruments and information listed above **are available to corporate purchasers and they meet the GHG Protocol's quality criteria** (p. 63). If a company either **does not have any such contracts or its instruments do not meet the quality criteria**, then it should use the residual mix - regional emission factors representing the untracked or unclaimed energy and emissions.

If the residual mix is not available, then the location-based method shall be used and companies should calculate their Scope 2 emissions with either regional/subnational grid averages or national grid averages. In this case, the reported market-based Scope 2 total will be the same as the location-based total.

Note: Additional reporting recommendations for choosing an emission factor in market-based accounting are given in section 3.4.

2. Scope 2 reporting requirements and recommendations

2.1 GHG Protocol recommendations for scope 2 accounting

CDP encourages its reporting companies to follow the accounting and reporting recommendations of the updated GHG Protocol Scope 2 Guidance published in January 2015. These recommendations can be summarized in three main elements, briefly explained below:

- Dual Scope 2 reporting requirements;
- Quality criteria for contractual instruments used to document Scope 2 emissions; and
- Additional disclosure recommendations.

Dual Scope 2 reporting requirements

The GHG Protocol Scope 2 Guidance introduces “dual reporting” duties for companies that operate in markets where contractual instruments are available. These companies shall report Scope 2 figures in two ways, using both the location-based method and the market-based method. CDP recommends that reporting companies perform dual reporting of Scope 2 emissions, following the CDP climate change reporting guidance. See section 3.1 to determine whether the market-based approach should be used for Scope 2 emissions reporting.

Quality criteria for contractual instruments

The GHG Protocol Scope 2 Guidance also specifies quality criteria for contractual instruments used to document Scope 2 emissions. The purpose of introducing the quality criteria is to help companies navigate whether the information they have is usable for credible and accurate market-based claims.

For contractual instruments, the GHG Protocol Scope 2 quality criteria require that they:

1. Convey GHG information;
2. Be an exclusive claim;
3. Be retired;
4. Match up to inventory period; and
5. Be sourced from same market as the company.

Note: CDP does not require that companies provide verification that their contractual instruments meet these quality criteria and this aspect has no impact on CDP scoring.

Additional disclosure recommendations

The GHG Protocol Scope 2 Guidance recommends that companies disclose additional information in order to distinguish differences in purchases between markets, and enhance transparency. This additional information concerns instrument labels, power plant features and the policy context (for example, about whether a power generating facility has received public subsidies). Companies can provide this additional contextual information in the comment column for relevant questions, for example C6.3 and C8.2e.

2.2 Reporting Scope 2 emissions to CDP

Clarification on market-based approach

It has come to our attention that the interpretation by some market actors of the new ISO 14064-1:2018 standard for organizational GHG quantification and reporting, is that it does not recommend the market-based approach to report Scope 2 GHG emissions as good practice. CDP can clarify that this is not our interpretation of neither the discussions held within the ISO 14064-1 revision working group (that CDP was part of), nor the final text version of the standard.

ISO 14064-1 explicitly acknowledges the use of the Scope 2, market-based approach in its section "9.3.3 Optional information and associated requirements", stating that "The organization may report the results of contractual instruments for GHG attributes (market-based approach), expressed in GHG emissions (tCO2e) as well as in the unit of transfer (e.g., kWh). The organization may report the amount purchased compared to the amount consumed". Further information is then provided in Annex E on the "Treatment of electricity", both for a location-based and market-based approach. In dealing with the two approaches in this way, ISO 14064-1 acknowledged the existence and acceptance of the market-based approach, even if the approach is not consensual within the GHG accounting community. ISO 14064-1 diverges from the GHG Protocol by not requiring all companies to report Scope 2 market-based figures. In our view, this does not disallow market-based as a GHG accounting approach and it is not our interpretation that deviations between ISO 14064-1 and the GHG Protocol can be claimed on "bad practices" in one or the other standard.

Therefore, CDP hereby clarifies that it will encourage companies to report market-based approach figures, in line with the two standards i.e. ISO 14064-1 and GHG Protocol Scope 2 guidance, and will consider it as best practice.

Furthermore, CDP will continue to work to make sure companies are aware of risks associated with any of the two accounting approaches and associated claims when reporting Scope 2 figures, as well as following up the debate on accounting GHG emissions of imported electricity and other energy carriers. CDP will also continue to use the tools available to drive its ultimate mission – the full decarbonization of the economy in line with the goals of the Paris Agreement – by encouraging companies to purchase renewable energy, and to finance and build new renewable energy capacity.

The GHG Protocol Scope 2 Guidance has specific reporting requirements which were first reflected throughout CDP climate change questionnaire in 2016.

Modules in the climate change questionnaire that are relevant for Scope 2 accounting are:

C4: Targets and performance

C5: Emissions methodology

C6: Emissions data

C7: Emissions breakdown

C8: Energy

Question specific guidance

- **C4.1a: Provide details of your absolute emissions target(s) and progress made against those targets.**
  - Please note that this refers to C4.1b as well.
  - As some companies will be calculating two Scope 2 figures (market-based and location-based), they may wish to set specific targets for each figure. For example, a company may intend to reduce their market-based figure through the purchase of renewable energy certificates, which would decrease that figure, but would not impact their location-based figure. This is just one approach to reducing emissions, and a company may also decide to set a location-based target focused on decreasing energy consumption and improving

energy efficiency. Thus, a company can set targets for a location-based figure, a market-based figure, or potentially both of them.

C4.2a: Provide details of your target(s) to increase low-carbon energy consumption or production.

- Targets related to increasing low-carbon energy consumption or production is an important element of organizations' strategy to reduce their Scope 2 emissions.
  - This question does not require any Scope 2 data inputs, but can be linked to an emission target from question C4.1a in Column 14 "Is this target part of an emission target?"

C5.1: Provide your base year and base year emissions (Scopes 1 and 2)

- Companies should ensure that the base year inventory includes both a location-based and market-based Scope 2 total, if applicable and feasible. This ensures "like with like" comparison over time. If the Scope 2 base year chosen was calculated only according to the location-based method, then you should also recalculate a market-based total if contractual information or residual mix totals are available for the base year. If not, you should state that the location-based result has been used as a proxy since a market-based result cannot be calculated.

C6.2: Describe your organization's approach to reporting Scope 2 emissions.

- Question C6.3 allows a company to report their Scope 2 emissions using both the location-based and market-based approach, in accordance with the GHG Protocol's Scope 2 Guidance. Question C6.2 allows a company to explain why they may not be providing a market-based emissions figure.
  - Most companies purchasing renewable energy would answer both location-based and market-based Scope 2 reporting approaches for this question. The exception would be a company with operations entirely in countries that offer no opportunity to obtain product- or supplier-specific data or to purchase contractual instruments such as RECs or GOs.

C6.3: What were your organization's gross global Scope 2 emissions in metric tons CO_2e?

- Companies are asked to provide both their Scope 2 figures (if applicable). Where a company responds "We have no operations where we are able to access electricity supplier emissions factors or residual emissions factors and are unable to report a Scope 2, market-based figure" or "We have operations where we are able to access electricity supplier emissions factors or residual emissions factors, but are unable to report a Scope 2, market-based figure" to C6.2, they will only be expected to report location-based figures. Please refer to chapter 3.2 below for a case study on calculating Scope 2 emissions.
- CDP has also introduced a comment column to help companies provide more context to their response, particularly in cases where a company has operations in regions where there are contractual instruments, but are not yet able to calculate a market-based Scope 2 figure.

C6.10: Describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tons CO_2e per unit currency total revenue and provide any additional intensity metrics that are appropriate to your business operations.

- Companies are required to disclose their emissions intensity for combined Scope 1 and 2 emissions against their total revenue for the reporting year, as well as at least one other metric of their choice. However, companies are required to be transparent about which Scope 2 figure they use. Companies should disclose this information in the column entitled 'Scope 2 figure used".

C7.5: Break down your total gross global Scope 2 emissions by country/region.

- Please note that this refers to C7.6a, C7.6b and C7.6c as well.
- CDP asks companies to provide a breakdown of Scope 2 figures. For example, companies are asked to breakdown their Scope 2 figures down by country, business activity, facility and emissions by activity. Each of these questions has a column for companies to provide a breakdown of their Scope 2 market-based emissions. The purpose of CDP requesting these breakdowns is to increase transparency on how they were calculated. E.g. a company may be required to provide both a market-based and location-based Scope 2 figure, but may also have operations in a country where there are no contractual instruments. By providing a country specific breakdown, a company can increase transparency on where there are contractual instruments.

- **C7.9b: Are your emissions performance calculations in C7.9 and C7.9a based on a location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?**
  - In question C7.9a, companies are asked to compare their combined Scope 1 and 2 emissions to the previous reporting year. Companies are only required to compare their Scope 2 emissions for just one Scope 2 figure (either location-based or market-based). In the interest of transparency, companies are required to state which figure they used.
  - A company may not have calculated a market-based figure in the previous reporting year. In this case, a company can recalculate the previous year figure according to the market-based principles, and then compare it with the current reporting year's market-based figure.

- **C8.2e: Provide details on the electricity, heat, steam, and/or cooling amounts that were accounted for at a zero emission factor in the market-based Scope 2 figure reported in C6.3.**
  - This question requests details on organizations' active sourcing of low-carbon energy. Companies are asked to break down which Scope 2 emission sources were accounted for at a zero emission factor. Furthermore, companies are asked to specify the low-carbon technology type, the amount of energy consumed and country/region of consumption.

2.3 Claiming renewable electricity use: the market boundary criteria

For the purpose of CDP reporting, to claim the use of renewable electricity, companies must **source renewable electricity from within the boundary of the market in which they are consuming the electricity.**

The "market boundary" refers to an area in which:

- The laws and regulatory framework governing the electricity sector are consistent between the areas of production and consumption.
- There is a physical interconnection between the point of generation and the point of consumption of renewable electricity. When interconnection happens across different grids, there must be a level of system-wide coordination between such grids.
- The countries' utilities/energy suppliers recognize each other's energy sourcing instruments and have a system in place to prevent double counting of claims

Based on our current knowledge, **the market boundary is defined for most of the countries as their geographical boundary**, except the following: 1) European countries which are AIB members[4] and 2) United States of America and Canada.

Exemption for contracts signed before 31st December 2021

[4] As Iceland has no physical grid interconnection with mainland Europe, CDP does not recommend using Icelandic GOs for consumption in mainland Europe.

Renewable generation projects are typically financed over a long period (e.g. 15-20 years) and corporate PPAs and Virtual Power Purchase Agreements (VPPAs) can be an important long-term revenue stream to drive project development. To avoid putting companies with existing sourcing contracts at a disadvantage and to enable a gradual transition to the market boundary criteria, renewable energy sourcing contracts involving transactions outside of the identified market boundary signed up to the **31st of December 2021** will be accepted in CDP reporting until the end of the respective contract period. This means that companies can continue to calculate their Scope 2 market-based emissions using the instruments procured before this date that do not meet this market boundary criteria. For transparency, when disclosing the renewable energy sourcing methods in C8.2e, companies are advised to provide the details of the contract i.e. the country of origin of instruments, the volume and the duration of the contract. This exemption only applies to instruments that meet the Scope 2 Quality Criteria – a set of minimum criteria that relate to the integrity of the contractual instruments as reliable conveyers of GHG emissions rate information and claims, as defined in the GHG Protocol.

Example: Company A has entered into Virtual Power Purchase Agreement (VPPA) with a Solar electricity generator in Spain. The contract was signed in February 2020 for 10 years. Company A will use the Guarantee of Origin (GO) certificates issued to the solar project in Spain for its operations in Germany, France and Poland. Poland is not an AIB member and thus is outside of the market boundary. However, since the contract was signed before December 2021, Company A can use GOs for its operations in Poland for CDP reporting until the end of the contract in January 2030.

Company A shall report this contract in question C8.2e of CDP climate change questionnaire and provide details in the “Comment” column about the country of origin of GOs (i.e. Spain) and duration of the contract (i.e. contract period February 2020 to January 2030).

2.4 How can companies go further?

How can companies go further with their Scope 2 reduction action? Section 11.4 of the GHG Protocol Scope 2 Guidance presents a range of procurement choices where companies can bring to bear their financial resources, creditworthiness, scale of consumption, technical knowledge, collaboration, or other approaches in order to help overcome traditional barriers to scaling the development of low-carbon energy.

These include a) Direct contracting with new low-carbon energy projects, b) working with electricity suppliers for new projects, c) establishing “eligibility criteria” for corporate energy procurement, relating to specific energy generation features or policy interactions that align with new low-carbon energy projects, and d) incremental funding or donations.

Ecolabels are a way for companies to do more with their purchases. The GHG Protocol Scope 2 Guidance mentions the EKOenergy label [5]as an option, as it is a mark of quality which comes on top of tracking certificates. Electricity sold with the EKOenergy label fulfills strict environmental criteria and raises funds for new renewable energy projects. Involvement, transparency and ‘deeds not words’ are important principles of EKOenergy’s work.

Another example is Gold Standard, an international standard for climate security and sustainable development. Gold Standard[6] has developed an ecolabel for attribute tracking systems including for use in combination with the I-REC Standard, EECS-GOs in Europe and other national/regional systems adherent to their quality standards. The Gold Standard REC label includes stringent requirements to ensure renewable energy projects meet highest safeguards, are inclusive of

[5] https://www.ekoenergy.org/ecolabel/
[6] https://www.goldstandard.org/our-story/sector-renewable-energy

stakeholders, contribute to sustainable development priorities, and generate new renewable energy that could not have otherwise been realized.

3. Accounting for Scope 2 emissions

The determination of whether the market-based method applies is made at the company level. If a company has any operations in any country where market-based options are available, it must report market-based emissions for all of its operations in all countries. This section aims to help companies understand whether or not they should use a market-based approach to Scope 2 accounting and to help them to choose an adequate emissions factor.

3.1 Determining the applicable Scope 2 methods

A company will need to determine if it must report a market-based Scope 2 figure in addition to a location-based figure in question C6.3. The GHG Protocol provides the decision tree below to help companies make this determination.

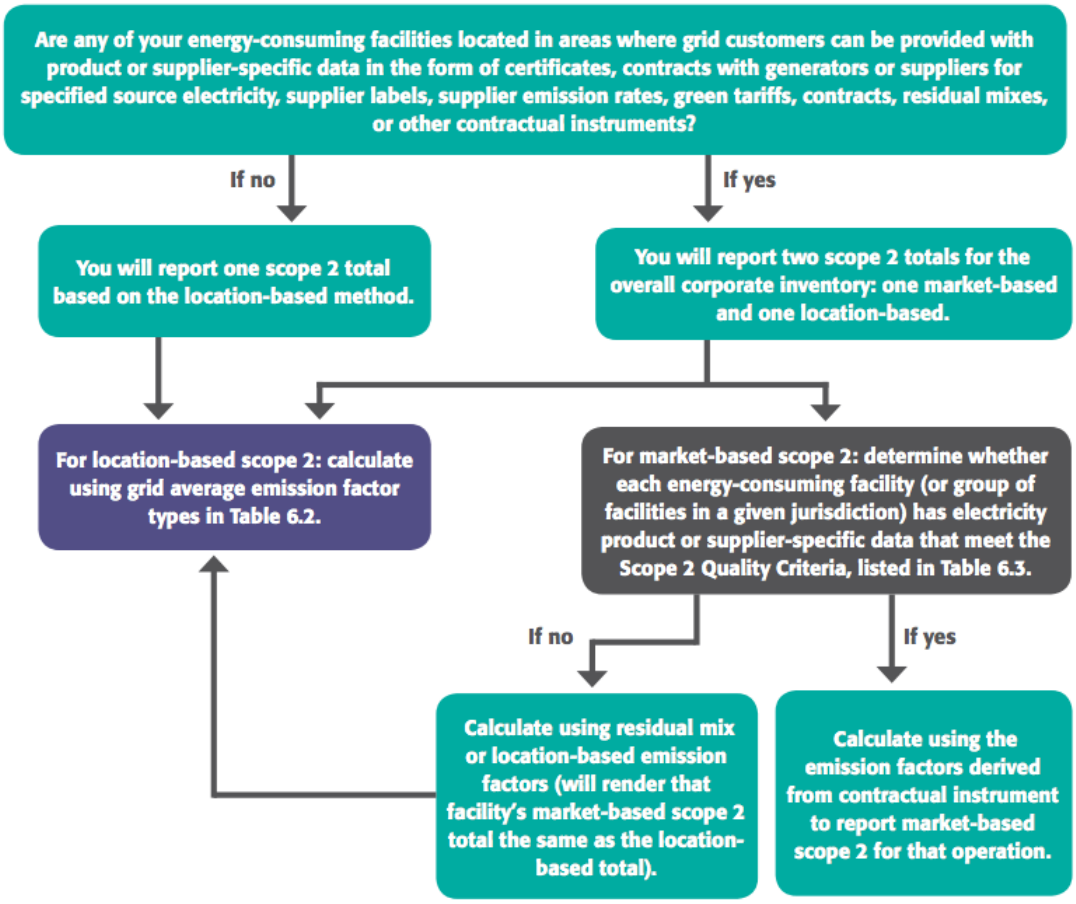


Figure 1: Determining which accounting methods to use for Scope 2. Source: GHG Protocol Scope 2 Guidance p. 45.

Companies are invited to read Chapter 6: Calculating Emissions of the GHG Protocol Scope 2 Guidance in full, for a comprehensive overview of key requirements, steps, and procedures involved in calculating Scope 2 emissions according to each method.

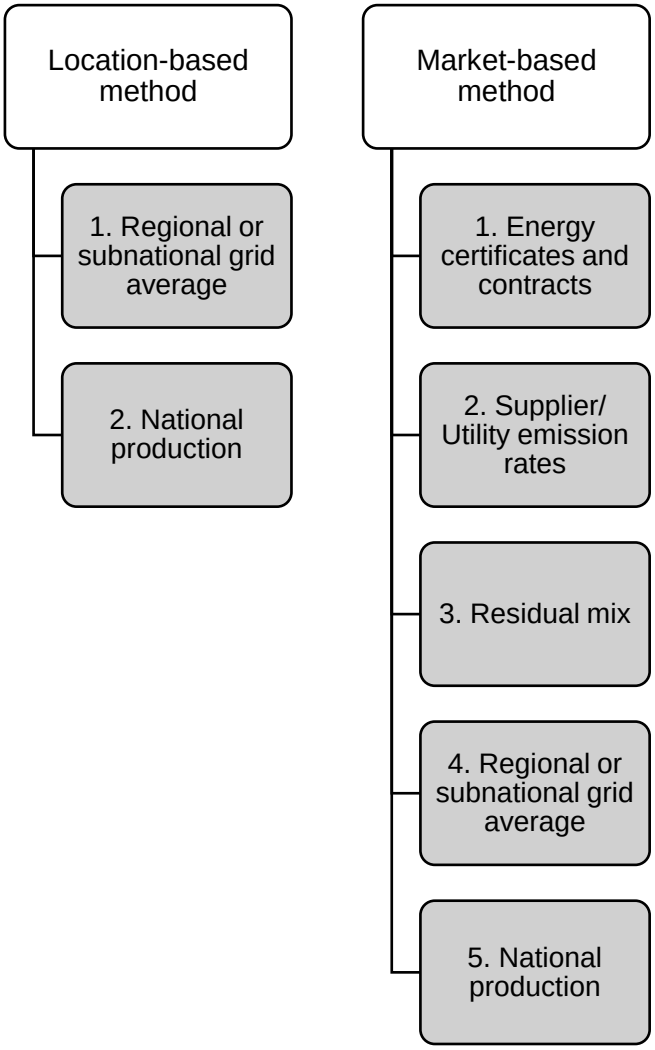
3.2 Choosing the right Scope 2 emission factors

After determining whether it needs to report only one location-based total, or both location-based and market-based totals, the company must select an emission factor for every emission source that is part of each total.

For both approaches, the GHG Protocol recommends a hierarchy of emission factors that should convey combustion-only (direct) GHG emission rates, expressed in metric tons per MWh or kWh.

The figure below presents the emission factor hierarchy for both methods, and lists all applicable source emissions factors along with a number reflecting the order in which they should be used.

Details on each emission factor for both accounting methods are given in section 3.3 and 3.4 below.



In a location-based calculation, the emission factor of each source of Scope 2 emissions in a country shall be the grid average emission factor, every time this data is available. Only when grid average data is not available, the national production emission factor shall be used instead.

Accordingly, in a market-based calculation, the highest order emission factors of each source of Scope 2 emissions are source-specific emission factors such as those conveyed by energy attribute certificates, Power Purchase Agreements or other contracts with sources, and so on until order no. 5.

Case study

Company A is a globally integrated business that has operations in four different countries. To develop their Scope 2 emissions inventory, they have collected data from each of the different global offices. As there are contractual instruments available in some countries in which the company operates, they are required to report both market-based and location-based Scope 2 figures for all of their operations.

USA: The company's US global office consumed 20,000MWh in the reporting year. They also purchase 20,000 RECs (1 REC=1MWh) from a solar farm. Because solar electricity generates no emissions, for their market-based figure they have used a zero emissions factor. For their location-based figure they have used the eGRID sub-region average factor multiplied by their purchased and consumed electricity.

UK: The company's UK office consumed 2,000MWh in the reporting year. For their location-based figure they used the grid average factor, while for their market-based figure they used the residual mix. This explains why their market-based figure is higher than their location-based figure.

China: The company's China office consumed 30,000MWh in the reporting year. They have purchased no contractual instruments, but as the company is still required to produce two Scope 2 figures, their location-based and market-based figures are the same.

India: The company's India office consumed 38,000MWh during the reporting year. Since 2012 they have had a collaborative partnership with a renewable energy company which provides a direct line from their solar panels to the company's office. In the reporting year this was 50% of their total consumption. Their location-based figure was calculated with the grid average factor. Their market-based figure was calculated by including the renewable energy purchased directly (19,000*0) while the remaining electricity calculated with the grid average factor as no residual mix is available.

Country	Electricity consumed	Location-Based Total ($mtCO_2e$)	Market-Based Total ($mtCO_2e$)	Instrument Types
USA	20,000	650	0	RECs to cover 100% of consumption
UK	2,000	100	500	Residual mix
China	30,000	800	800	N/A
India	38,000	850	400	Collaborative direct-line solar to cover 50% consumption
TOTAL		**2,800 $mtCO_2e$**	**1,750 $mtCO_2e$**	

3.3 Emission factors for location-based accounting

This section introduces types of location-based emission factors available, listed in order of preference based on the precision of the factors.

3.3.1 Regional or subnational grid emission factors

Grid average factors reflect the physical GHG intensity of the grid, which is essential information for the climate mitigation policies and initiatives. For this reason, the use of grid average factors is well known and accepted by the international GHG accounting community.

Scope 2 accounting that uses grid average emission factors however has a number of limitations:

1. The time lag in the publication of this type of data is usually over one year;
2. Methodologically, there is great deal of variation in how this data is produced, depending:
    a. Whether GHG emissions from fuel combustion besides CO_2 are accounted for or not;

b. Whether transmission and distribution losses are included or not[7];
c. Whether heat-related emissions are incorporated into the emission factor or not;
d. How the electricity grid is defined; and
e. National policies: in some jurisdictions renewable electricity and its associated emissions attributes are counted within the grid average emissions factor used by other end-users, leading to double counting of the benefits;

3. The use of grid average factors gives companies little flexibility in Scope 2 emissions action. Individual consumers have limited influence on the grid average value and, in practice, can only act to reduce the amount of electricity they purchase and consume. This system is not conducive to individual accountability and broader-ranging change in purchasing practices;
4. If the grid average produced is not corrected for the tracking instruments associated with electricity that have been sold separately, then it can lead to double counting of Scope 2 emissions[8]; The corrected value is the so-called residual mix (see section 3.4.3); and
5. The concept of what constitutes a "grid" is not properly defined at an international level for the purposes of producing emission factors. In Europe, for example, country-based emission factors are often called "grid average" when in reality the grid for that country is much broader and can span several countries.

Grid average factors are usually available for most countries or grids and are published by several organizations and government bodies, such as countries' ministries of environment and/or energy. When a grid emissions factor is corrected to take into account the allocation of renewable energy traded through attribute certificates, then it is referred to as **residual mix** (see section 3.4.3).

A useful source of grid average emission factor information is the **Institute for Global Environmental Strategies**, which has compiled grid emission factors utilized for registered CDM project activities from publicly available sources on the UNFCCC website.

Please refer to Chapter 4 for additional up to date sources of grid average emissions factors and residual mix figures for different countries and regions.

3.3.2 National production emission factors

The emissions intensity of overall national energy (or electricity) production is a data source of last resort for the calculation of Scope 2 emissions for a particular country or region, when regional or subnational emissions factor information is not available.

The International Energy Agency (IEA) publishes national production-based emission factors.

3.4 Emission factors for market-based accounting

This section introduces the types of market-based emission factors available, listed in order of preference based on the precision of the factors. A company should determine which of these emission factors are appropriate for each facility, and research and obtain the appropriate emission factors.

[7] This may lead to double counting. Under the GHG Protocol Corporate Standard, utility companies should report T&D losses within their Scope 2 figure. The end-user should report these losses under Scope 3.
[8] To avoid this type of double counting corrected emission factors need to be in place or pragmatic considerations need to be taken in account. Corrected emissions factors are currently being investigated in Europe under the REDISS project (http://www.reliable-disclosure.org/) and in the USA it has been estimated that the error from double counting when considering the e-GRID emission factors "is less than one half of one percent" (GHG Protocol Value Chain Standard, p. 14).

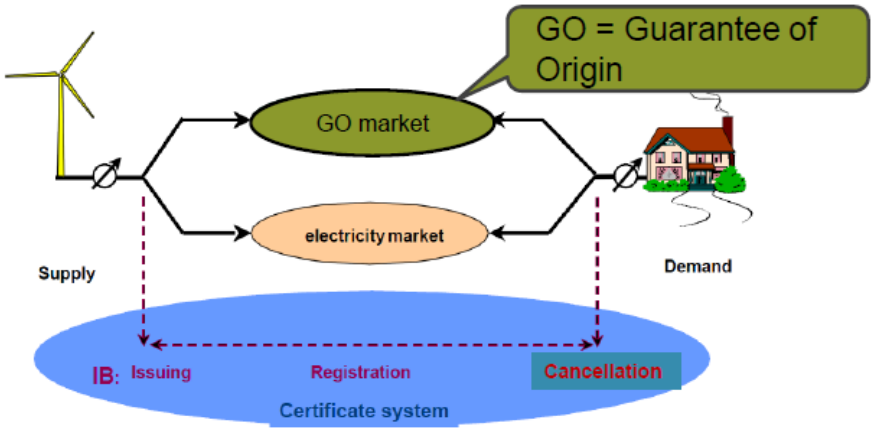
3.4.1 Energy attribute certificates and contracts

Energy Attribute Certificates

The GHG Protocol Scope 2 Guidance requires that the emissions factors from Energy Attribute Certificates (certificates) that a company has retained or acquired be the first choice in market-based Scope 2 accounting.

It is best practice to use certificates that rely on robust energy tracking and auditing systems that enable a link to be established between the energy production at a given source (with its specific attributes), and its sale through a network of suppliers, until it reaches the final consumer who will claim the specific characteristics of the original source. This tracking system does not aim to track the physical flow of electricity on the grid (which is not feasible). Instead, it aims to track the contractual relationships of the electricity purchase in a robust and auditable form.

An example of how tracking systems work is exemplified in the figure below, which represents how Guarantees of Origin, a type of certificates, are generated and traded in Europe.



Such systems provide the ability to document and track the entire chain of custody, and have already been implemented for carbon markets, forest products, marine products and the electricity market. For electricity markets there are two prominent established systems, the Renewable Energy Certificate systems (RECs) in USA and the European Energy Certificate System (EECS) system in Europe.

The use of such systems provides full tracking and auditing of the electricity custody chain, allowing the delivery of source-specific emission factors provided that any entity claiming certain characteristics of its electricity can point to appropriate certificates retired in the system, by the entity itself or by someone on their behalf.

Examples of reliable tracking systems

Reliable tracking systems are independent, transparent and robust. From a CDP perspective, there are five criteria that need to be fulfilled:

- There is an entity responsible for the instruments' generation (issuing body) that issues the instrument in a publicly available registry(ies) against renewable energy delivered by a generator. Only one instrument is issued per unit of energy (e.g. MWh) and this link is properly audited;
- A set of attributes are present in the instrument or can be legitimately inferred from it, namely:
  - Name of producer;
  - Technology type;
  - Year of installation;
  - Year of production;
  - State support/aid;
  - Emission rate; and
  - Other environmental characteristics.

- Properties should not be disaggregated, e.g. it is not allowed for one party to count for the GHG emission factor and another party to count for the fact that it is renewable in origin;
- There is an auditable chain of custody, that is, all information can be verified or audited by users in the system and the whole system is audited by external parties, guaranteeing that the link between generation, distribution and final consumption is effectively established and that there is a permanent retirement/cancelation mechanism within the system; and
- The information in the system can be used to avoid the double counting of attributes.

These systems have taken different forms to adhere to the different regulatory obstacles in each country or region where they are active. The three tracking systems described below, and their subsequent energy attribute certificates, are examples of reliable mechanisms for attribute delivery and individual consumer claims.

In addition to the issuance, tracking of properties and guarantee of the chain of custody, there can be certification schemes that will testify for the appropriate use of an instrument for a given purpose. These certification systems (or labels) can be based on appropriate tracking systems and add important assurances and quality criteria. An example of certification is the Green-e energy[9] program in the USA.

North American REC Tracking Systems

Electricity markets in the Unites States, Canada and Northern Baja California are served by a variety of geographically-defined tracking systems.[10] These systems were developed primarily to meet the needs of state-level renewable energy programs (renewable portfolio standards or RPS), and to facilitate electricity supply disclosure information (proof of sources of power) for load serving entities in deregulated (competitive) electricity markets. They also serve voluntary renewable energy market participants. All of the systems, with one exception[11], were developed and originally funded by governmental or quasi-governmental agencies interested in using the systems for regulatory compliance. North American tracking systems can be differentiated as either all-generation certificate tracking systems or systems that limit participation to renewable energy generation(RECs). There are three all-generation tracking systems, all in the Northeast United States (NEPOOL GIS, NYGATS and PJM-GATS). The rest are renewable energy only. Some of the systems in the US track generation within a single state (e.g., North Carolina and Texas), but most states using tracking systems participate in tracking systems designed to cover a multi-state footprint.

European Energy Certificate System Guarantee of Origin (EECS-GO)

Guarantee of Origin certificates are a European-wide requirement used to prove the share of energy from renewable sources to the final consumer. The mandate for national GO tracking system implementation is embedded in European law. This requirement however does not mandate the necessary technical systems to ensure that the GO is a reliable energy attribute certificate. National adoption of the European Energy Certificate System [12]or EECS Standard by national GO issuers ensures the standardization of consumer claims and the robustness of the energy attribute certificate. EECS-adherent countries represent a large majority of the European Member States. Within EECS countries, certificates can be electronically transferred to any other EECS country for subsequent cancellation and proof of electricity consumption in that area. Most European countries, and all EECS-adherent countries, mandate that consumer electricity usage claims be verified by GO cancelation. These countries ensure electricity supplier products are

[9] https://www.green-e.org/programs/energy
[10] See a map of North American tracking systems here: https://resource-solutions.org/wp-content/uploads/2018/02/Tracking-System-Map.pdf
[11] The North American Renewables Registry is a privately developed and administered tracking system that offers certificate tracking to generators in regions where there is not a tracking system established by state agencies or a regional transmission or system operator.
[12] https://www.aib-net.org/eecs

factual through frequent audits of their delivered electricity products. In Switzerland and Austria, the verification of consumer claims with the GO is mandated for all supplier-delivered electricity products, regardless of if it is a renewable or non-renewable product. This increasingly popular policy trend is called full-disclosure and is being discussed in a number of other European member states.

The International REC Standard (I-REC Standard)

The International REC Standard [13]is a stakeholder-led organization that provides a list of rules, regulations and best practices which together form the I-REC Standard. The I-REC Standard provides the blueprints for a standardized tracking system that can be easily implemented in any country or region. An I-REC standardized tracking system will provide an internationally recognized method for electricity attribute allocation in regions that lack this reliable or transparent tool. Together with governments, policy makers and informed stakeholders the I-REC Standard provides a simple method for the voluntary or compliance implementation of a tracking system, depending upon the needs of the local authorities. It is also possible to voluntarily implement an I-REC standardized tracking system in regions without an available system, assuming the I-REC Standard organization can provide reliable attribute transfers and claim exclusivity. For this reason, the legislative basis for I-REC certificate issuance will be different in each country where an I-REC standardized tracking system is active.

To make a reliable and cost-efficient system, a central registry system is used by all I-REC standardized tracking systems. This ensures the system is easily understood by its users and claims can be easily audited by third parties. Local issuance of I-REC certificates is administered by an independent local issuer preferably acting with the 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 the verified production.

Tradable Instruments for Global Renewables (TIGR Registry)

In 2016 the registry for Tradable Instruments for Global Renewables[14], TIGRs, was launched by APX, the company that operates the tracking systems in the United States, to meet demand for energy attribute tracking in Asia and beyond. The TIGR Registry℠ (the Registry) collects and tracks information regarding renewable energy generation originating within supported countries. The Registry is designed to provide a policy-neutral, market-driven, electronic system for participants in renewable energy markets. By creating a reliable process to evidence verification, issuance and Retirement of TIGRs℠ the Registry brings increased levels of integrity and trust to purchasers, sellers and regulators in the market. The Registry tracks and displays the attributes, certifications and program eligibilities associated with each TIGR, as established by documentation and/or third-party verification during the Asset registration process. Assets can be registered in the Registry based on ownership of the Asset or, if authorized, based on acting as the Responsible Party for the Asset.

The Registry provides Account Holders and the public with reports on activity within the system. The public reports are accessible to anyone via the public page on the Registry website. These public reports are designed to ensure Registry transparency as to TIGRs issued and Retired as well as providing visibility to the TIGR attributes and program eligibilities.

Other contractual instruments

[13] https://www.irecstandard.org/about-us/
[14] https://apx.com/about-tigrs/

In markets where certificates are not available, companies may rely on the emission factors of the contracts that it signs with suppliers and projects. These can be, for example, power purchase agreements (PPA) with grid connected generators and green electricity products (e.g. green tariffs) from an energy supplier, not supported by energy attribute certificates.

It is required by the GHG Protocol Scope 2 Guidance that these contractual instruments meet the Scope 2 Quality Criteria to be reliably used in market-based Scope 2 accounting.

3.4.2 Supplier-specific emission factor

An option when certificates and contractual instruments are not available is to use supplier-based average emission factors, as described in section 6.11.3 of the GHG Protocol Scope 2 Guidance:

"*The emission factor must include all the electricity delivered by the supplier, including electricity it generates as well as electricity it purchases from others. Some supplier emission factors only include generation facilities owned by the supplier, which does not represent the full electricity delivered. In addition, it should only include renewables for which RECs have not been passed on to and retired by a third party.*"

This can be a valid approach when electricity markets are liberalized and consumers have effective options of different suppliers and suitable tracking mechanisms and methodologies are in place for a harmonized approach on calculating the emissions factors for all suppliers in a given grid. This is largely the situation in Europe, where the RES Directive and the electricity labeling directive, provide a harmonized framework for tracking the electricity through Guarantees of Origin and a common obligation of disclosure to both national authorities and clients of the emission factor (fuel mix) of the electricity. However, European member states are in different stages of implementation of the EU obligations and there is still no full harmonization. Also, emission factors are provided with a delay of a year, which is an improvement in relation to "grid average" emission factors, but still leaves a gap between how the electricity emissions are estimated and the actual emissions. Additionally, if one company uses grid-average emission factors and another uses supplier-specific emission factors, there will be some degree of double-counting of renewable energy. Generally, one could say that whenever different emission factors are used that are not fully harmonized between them, there is potential for double counting of characteristics. Thus, part of the solution is to agree on what to use. For instance, Portuguese companies[15] seem to have reached an agreement to use supplier specific emission factors reported within the frame of European disclosure obligation. In the absence of an authority calculating annually a grid average emission factor[16], this seems to be an appropriate solution.

In other jurisdictions, similar disclosure obligations from energy providers to their clients or similar tracking mechanisms for electricity do not seem to exist, so this option might not be available at all. Furthermore, with no harmonization of approaches, companies could create their own accounting methodologies, leading once again to inconsistent accounting.

Where regulation and harmonization is in place, as is the case in the European Union, the use of this type of emission factor seems to offer a robust alternative to the grid-average. Namely it adds clarity as to:

- The context and purpose for which the emission factors are produced - in this case disclosure of electricity characteristics to consumers;
- The methodology followed (usually published by the electricity regulator/supervisor of the member state);
- The tracking mechanisms used;
- More up-to-date emission factors; and
- It can facilitate responsible consumer choices.

[15] Communication to CDP in a country workshop and as observed through CDP disclosures.
[16] Average emission factors are reported annually as part of countries' annual reporting obligations to the UNFCCC. However, these factors are methodologically closer to the IEA factors in the sense that they represent a "production country average" rather than a "consumption country average".

Supplier Mix Figures and Disclosure

Europe has instituted strong requirements on all electricity suppliers to provide their own independent supplier emission factor to all the consumers of their electricity products on a yearly basis. This allows all consumers, large or small, to know the exact quantity of carbon emissions and radioactive waste that they were responsible for in the previous year. These basic regulations, termed disclosure regulation, are elaborated on and further strengthened by many European member nations.

The legislation however remains unclear and varies by country with regards to the specific requirements for the CO_2 calculation, radioactive waste calculation and use of a production or consumption grid-mix calculation as the base figures. Until European disclosure rules address these issues there is the possibility of large variations between individual supplier mix figures.

3.4.3 Residual mix figures

A residual mix emission factor represents the emissions and generation that remain after certificates, contracts, and supplier-specific factors have been claimed and removed from the calculation. It can be a regional or national factor. Residual mix factors are the preferred market-based default emission factors for any of an organization's electricity for which it cannot apply one of the more-preferred emission factors above. This is because the use of residual mix emission factors avoids double counting of the emissions attributes of contractual instruments.

Currently, residual mix factors are not widely available. Companies must disclose the lack of residual mix factors as part of their Scope 2 reporting. As with other emission factors, organizations are encouraged to check for available residual mix factors each year when they complete their GHG inventory.

Example of Carbon Accounting with a Residual Mix

A company based in Norway is interested in calculating their emissions inventory for the year 2014. In 2013 they instituted an electricity savings program that cut their electricity consumption to 1000-MWh per annum. The company purchased Guarantees of Origin (GOs) to account for 50% of their consumption. These GO came from Norwegian hydroelectricity and the company has chosen to account Norwegian hydroelectricity as 0 (zero) gCO_2/kWh. The remaining 50% of consumption needs to be accounted for with the grid emission factor. The company follows best practice and has decided to use the residual mix emission factor. After reviewing the NVE website they saw that after import, export and electricity trading the Norwegian grid-mix in 2011 was responsible for 353.0 grams of CO_2 per kWh. 500 MWh of electricity with an emission factor of 353 gCO_2/kWh results in emissions for the grid consumed electricity of 176.5 tCO_2. The combination of 500 MWh originating from a hydroelectric plant and 500 MWh originating from the grid-mix resulted in total Scope 2 emission of 176.5 tCO_2.

3.4.4 Other grid-average emissions factors

Following the hierarchy, when emissions factors from certificates, contracts, suppliers and residual mix are not available, it is recommended that companies use regional or subnational grid factors and, as an option of last resort, national production factors in market-based accounting.

3.5 The use of green gas certificates for GHG and RE usage claims

Green gas certificates are a relatively new product, where green gas certificates originating from biogenic sources can be purchased to match non-biogenic gas. Similar to energy attribute certificates, with green gas certificates the end-user can claim a zero-emission rate.

When gas is sourced from a shared pipeline network with multiple sources including both renewable and non-renewable sources, certificates are required to demonstrate the renewable origin of gas (i.e. "certified biogas"). To make a renewable electricity usage claim on electricity generated onsite from gas the following conditions need to be met:

- The company combusts gas sourced from a shared gas pipeline network to produce electricity;
- It also owns or purchases green gas certificates that originated from one of the gas producers on the pipeline network – these need not necessarily be purchased directly from the biogas producers;
- The company permanently retains the environmental attributes of the electricity generation, including any electricity attribute certificates (e.g. RECs in the U.S.) for the electricity generated.

Market boundary considerations

It is required that use of gas certificates be limited to users on the same pipeline network who can physically receive gas from gas plants on that network.

Certificates can be purchased from either the same supplier as the gas or a different supplier, provided all suppliers and the user are on the same pipeline.

Existing schemes and verification

Green gas schemes are robust tracking systems which help with assurance around data quality and double issuance of certificates. It is recommended that green gas certificates used for GHG or RE usage claims be verified by an independent third party against the Scope 2 quality criteria. This effort would have to be undertaken by the purchaser. CDP do not know of any such verification standard or providers at this time.

Recommendations on using green gas certificates

- Green gas certificates need to be legitimate and legally enforceable means of transacting property rights and claims to biogenic or renewable fuel attributes of gas production in a specific market;
- The GHG Protocol's Scope 2 Guidance recommends considering and applying the Scope 2 quality criteria to green gas certificates
- To make a renewable electricity usage claim valid for RE100, in addition to the above, a company still needs to produce and retain an energy attribute certificate (see RE usage below).

4. Country and regional guidance and resources

This section presents a collection of additional notes and resources to guide companies in reporting about Scope 2 emissions in specific regions and countries. This section will be updated on an annual basis. CDP invites company and stakeholder inputs to keep this section up to date.

4.1 North and South America

4.1.1 United States of America

Grid average emission factors in the USA: the eGRID approach

eGRID is the US EPA initiative that calculates and reports electricity grid average emission factors for the USA every few years. The most recent emission factors were calculated in 2016 and the initiative plans on releasing updated figures in 2020. The eGRID is based on NERC (North American Electric Reliability Corporation) power grid regions, but further refines them in subregions of electricity distribution grids based on (distribution) companies. It attributes a specific power plant to a grid subregion (and not on a geographical boundary per state) considering the physical link between the plant and the distribution grid. It also takes into consideration the import-export of electricity between the several subregions defined.

eGRID does not consider the impact of the sales of Renewable Electricity Certificates in the published average emission factors of the eGRID subregions. Overall, for the US market this fraction is considered small and the overall impact on the emission factors calculated negligible (IEA, 2014). However, CDP is unfamiliar with the actual data sources and methodology followed to conclude this and namely, if there are any eGRID subregions that could be more impacted than others.

Energy Residual Mix Emissions Rates: Green-e

Green-e is the trusted global leader in clean energy and carbon offset certification. Green-e Energy Residual Mix Emissions Rates (2018) can be used by electricity users in the U.S. and Canada for calculating the Scope 2 greenhouse gas (GHG) emissions associated with unspecified sources of electricity (i.e. any portion of electricity use for which specified sources of electricity have not been purchased).

North America's (US and Canada) Renewable Energy Certificate (REC) System

Given the physical limitations of tracking electricity on the grid, in the US and Canada, the primary tool for assigning ownership of the attributes associated with renewable electricity generation is the renewable energy certificate (REC). A REC is a fungible commodity that represents the renewable attributes of one megawatt hour (MWh) added to the grid. In the US, RECs form the sole basis of all renewable electricity usage claims on the grid. They are used by utilities and other electric service providers to demonstrate compliance with state renewable portfolio standards (RPSs), and they are also the basis for all voluntary renewable energy transactions and product types, including power purchase agreements, utility green pricing products, competitive electricity products, and unbundled REC products.

In the voluntary market, RECs convey the rights to the generation attributes of renewable generation, including the GHG emissions per MWh of electrical output (emissions factor) of the renewable generator, which is typically zero. USA RECs also convey the avoided or displaced GHG emissions on the grid as a result of the generation. In areas where GHG emissions are not controlled (or capped) by regulation, or where an allowance/permit-retirement mechanism is in place for voluntary renewable energy purchasing within a capped area, these avoided grid emissions are not zero. This is an impact of generation that is conveyed as an attribute and included in the REC and which can be reported in "Further information" in CDP disclosure.

To convey these and other non-carbon attributes in the voluntary market, RECs must be fully aggregated (this is, no attributes can be sold separately), surplus to regulation and of eligible recent vintage (not banked). Also, contracts and purchases of renewable electricity, including RECs, must be substantiated to ensure exclusive ownership of generation and prevent double counting/claiming.

REC certification is available and widespread in the US and Canada through the Green-e® Energy program. For further information about the Renewable Energy Certificate System (RECS) in North America check the following references:

- "Guide to Purchasing Green Power: Renewable Electricity, Renewable Energy Certificates and On-Site Renewable Generation" (March 2010). Written by the US EPA, US DOE, World Resources Institute, and CRS, this comprehensive guide is recommended reading for anyone considering green power procurement;
- "Renewable Energy Certificates, Carbon Offsets, and Carbon Claims: Best Practices and Frequently Asked Questions" (April 9, 2012). Includes answers to many questions about renewable energy certificates, carbon offsets, and the relationship between renewable energy and greenhouse gas reductions; and
- "Quick Guide: Renewable Energy Certificates (RECs) (Fact Sheet)". Federal Energy Management Program (FEMP) (2011). A brief from NREL on what RECs are and how they can also be used to help Federal agencies meet greenhouse gas (GHG) emissions reduction goals.

More information can also be found in the following websites:

- https://www.epa.gov/greenpower/renewable-energy-certificates-recs
- http://www.green-e.org/
- https://resource-solutions.org/wp-content/uploads/2018/02/Tracking-System-Map.pdf
- http://www.epa.gov/greenpower/gpmarket/rec.htm

4.1.2 Brazil

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Brazil. The issuer in Brazil is Instituto Totum. For more information, view the authorized issuer list here.

4.1.3 Chile

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Chile. For more information, view the authorized issuer list here.

4.1.4 Colombia

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Colombia. For more information, view the authorized issuer list here.

4.1.5 Costa Rica

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Costa Rica. For more information, view the authorized issuer list here.

4.1.6 Guatemala

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Guatemala. For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in Guatemala: http://tigrs.apx.com/.

4.1.6 Honduras

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Honduras. For more information, view the authorized issuer list here.

4.1.7 Mexico

International REC Standard (I-REC)

Issuance will only be authorized from production devices that do not obtain CELs (Certificados de Energía Limpia). For more information, view the authorized issuer list here.

4.1.8 Panama

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Panama. For more information, view the authorized issuer list here.

4.1.9 Peru

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Peru. For more information, view the authorized issuer list here.

4.2 Asia

4.2.1 Bangladesh

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in Bangladesh: http://tigrs.apx.com/.

4.2.2 China (People's Republic of)

Grid average emission factor in China

In China, the Department of Climate Change, National Development and Reform Commission (NDRC) calculates grid emission factor for the electricity generation. NDRC use Clean Development Mechanism (CDM) methodologies, especially the methodological tool to calculate the emission factor for an electricity system[17].

[17] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

The national power grid in China is divided into Northeast China Grid, North China Grid, East China Grid, Central China Grid, Northwest China Grid and China Southern Power Grid, excluding Tibet Autonomous Region, Hong Kong Special Administrative Region, Macao Special Administrative Region and Taiwan Province.

The emission factors have been determined on the basis of Operating Margin (OM) as well as Build Margin (BM). Operating margin represents the weighted average emissions rate of all thermal stations currently operational in the regional grid whereas the build margin reflects the average CO_2 emissions rate of newly built power stations.

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in China. Issuance in China is restricted to state-owned production devices. For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in China: http://tigrs.apx.com/.

4.2.3 India

Grid average emission factor in India

In India, Central Electricity Authority (CEA) calculates grid emission factor for the electricity consumption. CEA use Clean Development Mechanism (CDM) methodologies, especially the methodological tool to calculate the emission factor for an electricity system. By 2020, CEA have published 14 versions of grid emission factor database. The most recent version (version 14.0[18]) has been released on December 2018 . CEA update the database at the end of each fiscal year.

The Indian electricity system is divided into two grids, the Integrated Northern, Eastern, Western, and North-Eastern regional grids (NEWNE) and the Southern Grid. Each grid covers several states. As the grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with the neighboring countries Bhutan and Nepal.

CEA provide four different types of emission factors. These are weighted average, simple operating margin (OM), build margin (BM) and combined margin (CM) emission factors. The weighted average emission factor describes the average CO_2 emitted per unit of electricity generated and injected in the grid. It is calculated by dividing the absolute CO_2 emissions of all power stations in the region by the region's total net electricity generation including the generation from hydro and nuclear power stations (but excluding other non-conventional renewable energy stations such as hydro stations up to 25 MW, as well as all wind, biomass and solar photovoltaic stations).

Three emission factors (OM, BM and CM) are specifically developed as per the requirement of GHG emission reduction projects under the CDM. Simple operating margin represents the weighted average emissions rate of all thermal stations currently operational in the regional grid whereas the build margin reflects the average CO_2 emissions rate of newly built power stations. The combined margin emission factor is a weighted average of the simple operating margin and the build margin.

The grid emission factors mentioned above are only for CO_2 emissions, and do not cover CH_4 and N_2O. It only reflects CO_2 emissions per MWh of electricity generated without taking account of transmission and distribution (T&D) losses.

[18] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

CEA publishes all four emission factors for the NEWNE and the Southern Grids. As per GHG Protocol's Scope 2 Guidance, the weighted average grid emission factors can be used for the calculation of Scope 2 emissions.

India's REC system

Renewable Energy Certificate (REC) mechanism in India is developed to create a market-based instrument to promote renewable energy and facilitate compliance of Renewable Purchase Obligations (RPO) applicable on power distribution companies and captive electricity consumers (Obligated entities). As per the RPO target, obligated entities are mandated to purchase certain amount of energy from renewable energy sources. Electricity produced by renewable energy sources is conceptually split into the pure electricity component and the environmental component. The environmental component is called the Renewable Energy Certificates (REC).

A company engaged in generation of power from renewable energy sources is eligible to participate in the REC scheme provided that it meets certain terms and conditions set by central electricity regulatory commission. One REC is equivalent to one mega-watt hour (MWh) of electricity generated by renewable energy power plant. REC registry of India tracks the movement of RECs and keeps records of REC generation, trading and redemption/retiring.

Obligated entities can fulfil their RPO target either by purchasing (and retiring) RECs or by directly sourcing energy from renewable energy generator. Companies other than obligated entities can also claim the environmental benefits of renewable energy by acquiring RECs voluntarily.

There are two types of RECs in India, i.e. solar RECs and non-solar RECs. Solar RECs are issued for generation of electricity based on solar as renewable energy source, and non-solar RECs are issued for generation of electricity based on renewable energy sources other than solar. Both types of RECs are equivalent to renewable energy generation.

RECs are tradable on designated energy exchanges, i.e. Indian Energy Exchange (IEX) and Power Exchange India (PXIL). Obligated entities and voluntary REC buyers are required to be registered on any one of the exchanges to do the transaction. Bilateral transaction of RECs is not permitted in India. Renewable energy generators are also permitted to retain REC for complying to their own RPO targets. Such transactions happen on the REC registry of India.

More information is available at www.recregistryindia.nic.in, www.iexindia.com, and www.powerexindia.com.

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in India.For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in India: http://tigrs.apx.com/.

4.2.4 Indonesia

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in in Indonesia. For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in the Indonesia: http://tigrs.apx.com/.

4.2.5 Japan

Non-Fossil Value certificate (NFV)

Japan introduced new energy attribute certificates, which are unbundled with electricity generated from non-fossil energy sources and referred as Non-Fossil Value certificates (NFV). NFVs are issued for each kWh generated from power plants which utilize resources other than fossil fuel and can be traded among Load-Serving Entities (“LSE”) (i.e. electricity retailers) on the Japan Electrical Power Exchange (“JEPX”). JEPX is the single wholesale electricity market designated by the Japanese Government in accordance with the Electricity Business Law, and JEPX will handle NFV in accordance with the JEPX’s operational regulation which is approved by the Ministry of Economy, Trade and Industry (METI).

J-credit

In April 2017, METI transformed its offset-credit scheme "J-credit system" in a way that can provide businesses with offsetting credits and Energy Attribute Certificates (EAC) in the form of J-Credits. J-Credits that are issued for renewable energy generation, convey information about direct emissions occurring at the point of energy generation.. Consumers of Renewable-energy-based J-Credits, can choose whether to retire them as an offsetting credit or as EAC. Please see more information here.

Green Energy Certificates (GEC)

The Green Power Certificate scheme was introduced in 2000 by the Japan Natural Energy Company Ltd and was the first energy attribute certification scheme in Japan. In 2008, the Green Electricity Certificates Guidelines were designed at the committee set by METI. At the same time, the Green Energy Certification Center was established as an individual and neutral body in charge of certifying green electricity generated in power plants as meeting the renewable energy criteria. The Green Electricity Certificate is a private scheme, but it was established with the purpose of supporting renewable energy deployment. Additionality criteria are defined in their standards, to ensure they contribute to the building of new facilities or to sustaining existing facilities. The GECs are fairly transparent, although all the currently available information is in Japanese. They contain facility-level data, and the organizations that purchase GECs are fully disclosed. As the GECs are verified manually, the amount of issuance is small, and the cost is high.

If companies wish to buy certificates, they can contact issuers, such as Japan Natural Energy Company Limited.

More information about the Japanese electricity market and instruments can be found in here – English and Japanese

4.2.6 Malaysia

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Malaysia. For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in Malaysia: http://tigrs.apx.com/.

4.2.7 Philippines

International REC Standard (I-REC)

Issuance will only be authorized from production devices that do not receive national public support in the form of the feed-in-tariff. For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in the Philippines: http://tigrs.apx.com/.

4.2.8 Singapore

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Singapore. For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in Singapore: http://tigrs.apx.com/.

4.2.9 Sri Lanka

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Sri Lanka. For more information, view the authorized issuer list here.

4.2.10 Taiwan

Taiwan REC Standard (T-REC)

In June 2017, Taiwan opened its National Renewable Energy Certification Center (T-REC Center) which issues contractual instruments. T-RECs may be used to prove consumption of renewable electricity.

The paper "Introduction of the Linkage between Taiwan Renewable Energy Certificate Tracking System and National Greenhouse Gas Registry Platform"[19] provides more information on how the T-REC system is set up, how it complies with GHG Protocol Scope 2 criteria and its linkages with the GHG reporting system.

International REC Standard (I-REC)

Issuance is only authorized from non-wind and solar production devices due to potential interactions with the Taiwanese Green Purchase Program and developing Taiwanese REC scheme. For more information, view the authorized issuer list here.

4.2.11 Thailand

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Thailand. For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in Thailand: http://tigrs.apx.com/.

4.2.12 Vietnam

[19] The original in Chinese can be found here; the English version has been kindly provided to CDP by the authors.

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Vietnam. For more information, view the authorized issuer list here.

The TIGR Registry

At the time of publishing, renewable energy generators can utilize the TIGR Registry and issue TIGR instruments in Vietnam: http://tigrs.apx.com/.

4.3 Europe

Europe's Grid Emissions and the Residual Mix

Europe has slowly been transitioning to a consumption-based calculation for grid average emission factors. These consumption-based grid average emission factors take the production mix of a given geographic location - in the case of Europe, a national boundary - and account for the physical flows of electricity with its neighbors. In addition, accounting is done for the use of European electricity tracking instruments such as the Guarantee of Origin (GO). In Europe, the GO allocates the grid emission rights of renewable energy to a single end-user – for this reason the grid itself loses these attributes. After the private consumption of GO attributes has been calculated, as well as the physical imports/exports of electricity, one is left with the consumption-based grid emission average. This consumption average is termed a residual mix.

The use of a residual mix allows the end-user to obtain the highest possible accuracy when accounting for the grid-mix in one's carbon accounting. This represents a substantial improvement in the accuracy of accounting when compared with the emission figures of a production-based calculation for grid-mix emissions. The use of a residual mix ensures that renewable electricity attributes are not "double counted" to all the users of the grid. While most European member states do not force the use of a residual mix, it is increasingly apparent that this is the best practice.

Residual mix figures, like all grid emission factors, are calculated the year after the physical consumption of the electricity. This means that carbon accounting for 2018, for example, will use residual mix emissions calculations from the previous year (2017). Since 2015, residual mix figures in Europe have have been calculated on a yearly basis by the Association of Issuing Bodies (AIB). In their report, "European Residual Mixes: Results of the calculation of Residual Mixes for the calendar year 2019"[20], residual mix figures for all European countries are displayed. This report lays out the substantial differences between a grid-mix calculation based on the production of electricity and a grid-mix calculation based on the consumption of electricity, corrected for GOs (the residual mix). The significant improvements in a consumption-based grid mix calculation increase the accuracy of grid-emissions calculations and carbon accounting procedures.

Europe - Emission factors and sources of emission factors

The AIB calculates and publishes residual mix emission factors for all European countries. European residual mixes for years 2009 to 2014 were calculated by the Reliable Disclosure Systems for Europe (RE-DISS) Project Phases I and II. As the RE-DISS project ended in September 2015, AIB has continued to calculate and publish residual mix emission factors for subsequent years. European residual mix information is commonly reported in May of each following year.

Renewable energy tracking systems in Europe - Guarantee of Origin and EECS

The Guarantee of Origin (GO) is the main electricity tracking instrument for Europe. Each European member state is mandated by European law to have a national GO certificate system to be used as proof of electricity origin. This GO, often referred to as a RES-GO (Renewable Energy Source Guarantee of Origin), is described in European Directive 2009/28/EC:15 as, "…proving to final customers the share or quantity of energy from renewable sources". However, national regulations defining the specific use of the GO vary between many member states. To standardize

[20] See https://www.aib-net.org/sites/default/files/assets/facts/residual-mix/2019/AIB_2019_Residual_Mix_Results_1_1.pdf

national rules for GOs, the European Energy Certificate System, or EECS[21] system, was created by an organization representing 27[22] national GO issuing bodies. This association is named the Association of Issuing Bodies (AIB).

GOs standardized via EECS are easily transferable to and from other EECS standardized member states and allow for the easy trade of renewable energy attributes. Every year there are additional national GO issuing bodies that join the EECS system. This helps to make European renewable attribute trading more reliable, efficient and trustworthy. A GO standardized by EECS is often termed as an EECS-GO. The EECS system also allows for the issuance of EECS-GOs from fossil-fuel production stations. These fossil-fuel GO certificates can be used by consumers or electricity supply companies to prove the origin of all their electricity purchases or sales, not just renewables. This additional aspect is not mandated in European regulation but can improve the accuracy of greenhouse gas accounting and fuel-mix disclosure.

The Guarantee of Origin, both RES-GO and EECS-GO, are based on a book-and-claim system. This allows a GO to be created (booked in) by a specific producer of electricity and consumed (claimed) by a single consumer. Thus, the end-user who has purchased and canceled a GO (canceled is the industry terminology for consumption) can claim 1-MWh of electricity consumption from the specific production site of that canceled GO. Each GO is standardized as accounting for 1-MWh of electricity allowing end-consumers to purchase the amount of GOs needed to help meet their Scope 2 carbon accounting goals.

Guarantee of Origin certificates prove the origin of electricity and contain only factual information about the production site of the originating electricity. End-users are allowed to claim a number of different factors regarding their electricity consumption after the purchase of GOs. Items such as the carbon emissions of their purchased electricity can be inferred based on the production site from which the GO was purchased. The GO itself does not make a claim that zero emission electricity was purchased, only for example, that electricity from a wind turbine was consumed. Most consumers are aware that electricity from wind production produced zero direct emissions, but the consumer can decide if wind electricity should include life cycle emissions changing how their GO purchase is reflected in their carbon accounting.

An Example of Electricity Consumption with the GO

A corporation has had 120-MWh of electricity consumption in 2017, from several plants located around the world, including Sweden, Germany, Iceland and Spain. After implementing an electricity savings plan, they saw a drop in their electricity consumption to 100-MWh in 2018. Their goal was to have 80% renewable electricity for their remaining consumption. This corporation, based in Sweden, wanted 50% of their electricity to come from Swedish hydropower stations, 30% from wind sources in Europe and 10% from Icelandic geothermal production. To prove this, they bought 50 GO certificates originating from Hydropower stations in Sweden, 30 GO certificates from wind power stations anywhere in Europe, and 10 GO certificates from Icelandic geothermal power. Once these GOs were cancelled on their behalf the company can claim electricity consumption of 50% hydroelectricity, 30% wind, 10% geothermal and 10% grid-mix.

Europe - Other schemes and labels

Other certification/tracking schemes might exist in Europe depending on the country. There are a multitude of labels offering renewable energy for sale. CDP's recommendation is that, independently of the label, companies operating in Europe should make sure that the tracking system behind the label is the one mandated by European law: Guarantees of Origin.

4.3.1 France

Residual mix calculations in France

[21] https://www.aib-net.org/eecs
[22] https://www.aib-net.org/facts/aib-member-countries-regions/aib-members

Companies calculating market-based Scope 2 totals for France are encouraged to use the residual mix factor calculated by AIB.

Companies should also be aware of the existence of two other emission factors for the French electricity grid:

1. Emissions factor based on the methodology for regulatory compliance with Article 75 Loi Grenelle II; and
2. Emissions factor calculated by Ademe

Both sources are available here and require registration.

The use of these emissions factors is not recommended for reporting to CDP, especially for multinational companies seeking methodological uniformity in Scope 2 accounting around the world.

4.3.2 United Kingdom

Renewable Energy Guarantees of Origin (REGOs)

In the United Kingdom, Renewable Energy Guarantees of Origin (REGOs) are contractual instruments that may be used to prove consumption of renewable electricity adhering to the EU directive 2009/28/EC for the implementation of Guarantees of Origin.

Following the UK's departure from the EU, and at the time of writing (March 2021), the UK Office of Gas and Electricity Markets (OFGEM) advises that the UK Government "will ensure that Great Britain and Northern Ireland will continue to issue REGOs and accept Guarantees of Origin (GoOs) from EU member states from 1 January 2021 (i.e. once the implementation period has expired). This will allow electricity suppliers in the UK to continue to use REGOs and EU GoOs to comply with their fuel mix disclosure obligations."

REGOs should not be confused with Renewables Obligation Certificates (ROCs) and Levy Exemption Certificates (LECs). ROCs are instruments used to comply with the renewables production obligation on suppliers. LECs are a levy/tax exemption for medium-sized enterprises. ROCs and LECs should not be used in responding to CDP.

4.3.3 Turkey

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Turkey. For more information, view the authorized issuer list here.

4.4 Rest of the World

4.4.1 Australia

Australia's REC market

Australia has one of the oldest functioning renewable energy certificate markets in the world. The government's voluntary GreenPower Program was launched in 1997, and the compliance market-based on REC surrender was legislated in 2000 and operational from 2001.

Australian RECs are compliance instruments which serve primarily as the mechanism for meeting the Government's national Mandatory Renewable Energy Target (MRET or RET). This was set in early 2015 at 33,000 GWh of large-scale renewable energy generation in 2020 (23.5% of projected generation).

There are two types of REC – Large Scale Generation Certificates (LGCs) and Small-scale Technology Certificates (STCs). LGCs come from renewable power stations, whereas STCs come from small-scale (<100kw) end-user sited installations.

All electricity retailers and a few very large end-consumers are legally required to surrender a certain number of both LGCs and STCs (separate obligations, each based on a percentage of the liable entity's total annual electricity purchased).

All certificate issuance, holding, transfer, surrender, etc., is done on the Australian REC Registry, which is operated by the Clean Energy Regulator.

Credit: Climate Friendly Australian REC Market Overview, March 2016

4.4.2 Egypt

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Egypt. For more information, view the authorized issuer list here.

4.4.3 Israel

International REC Standard (I-REC)

Registrations will take place through Green Energy Services. Green Energy Services can be contacted directly through their e-mail issuer@greenenergyservices.co.il. For more information, view the authorized issuer list here.

4.4.4 Jordan

International REC Standard (I-REC)

Registrations will take place through Dubai Carbon Centre of Excellence (DCCE). DCCE can be contacted directed through their website https://dcce.ae/contact-us/. For more information, view the authorized issuer list here.

4.4.5 Morocco

International REC Standard (I-REC)

Registrations will take place through DCCE. DCCE can be contacted directly through their website http://dcce.ae/i-recs/. Currently there are no restrictions to issuance. For more information, view the authorized issuer list here.

4.4.6 Nigeria

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Nigeria. For more information, view the authorized issuer list here.

4.4.7 Oman

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Oman. For more information, view the authorized issuer list here.

4.4.8 Saudi Arabia

International REC Standard (I-REC)

Registrations will take place through Dubai Carbon Centre of Excellence (DCCE). DCCE can be contacted directed through their website https://dcce.ae/. For more information, view the authorized issuer list here.

4.4.9 South Africa

Grid emission factors in South Africa and the SAPP group of countries

The Southern African Power Pool (SAPP) calculates grid emission factors for the electricity generation for South Africa and other groups of countries. SAPP use Clean Development Mechanism (CDM) methodologies, especially the methodological tool to calculate the emission factor for an electricity system[23]. The emission factor is known as standardized baseline emission factor which provides the values of the CO_2 emission rate of the interconnected electricity system (grid) of the SAPP and it is applicable to the group of countries that are members of the SAPP. This includes The Republic of Botswana; The Democratic Republic of the Congo (DRC); The Kingdom of Lesotho; The Republic of Mozambique; The Republic of Namibia; The Republic of South Africa; The Kingdom of Swaziland; The Republic of Zambia and Zimbabwe.

The emission factors have been determined on the basis of Operating Margin (OM), Build Margin (BM) and Combined Margin. Operating margin represents the weighted average emissions rate of all thermal stations currently operational in the regional grid whereas the build margin reflects the average CO_2 emissions rate of newly built power stations. The combined margin emission factor is a weighted average of the simple operating margin and the build margin.

The latest SAPP Grid Baseline Emission Factors were published in 2018, available here.

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has no restrictions to issuance in South Africa. For more information, view the authorized issuer list here.

4.4.10 Uganda

International REC Standard (I-REC)

At the time of publishing, the I-REC Standard has authorized an issuer to conduct I-REC issuance in Uganda. For more information, view the authorized issuer list here.

4.4.11 United Arab Emirates

International REC Standard (I-REC)

Registrations will take place through Dubai Carbon Centre of Excellence (DCCE). DCCE can be contacted directed through their website https://dcce.ae/. For more information, view the authorized issuer list here.

[23] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

5. Frequently Asked Questions (FAQ's)

What type of certificates/instruments can be used in my market-based Scope 2 figure?

CDP recommends that appropriate tracking instruments are used. Please see the section 3.4.2 for examples of reliable tracking systems and section 4 for regional notes and resources.

Can I count a GO/REC/I-REC/TIGR towards my Scope 2 market-based target?

Yes.

Can I count CERs or VERs towards my Scope 2 market-based target?

No.

I buy special European credits from a label with guaranteed additionality, but they do not follow the GO system, can I count them towards my target?

CDP does not recommend that any electricity within the EU27 should be accounted for unless it is using European Guarantees of Origin. Please see the section "Europe - Guarantee of Origin and EECS".

Can I use European GOs to account for electricity consumption in USA?

No, as this wouldn't comply with the market boundary criteria as described in section 2.3. Please see the next question for more details.

Why can't I use RECs or certificates produced in certain jurisdictions in other jurisdictions?

As a minimum condition, you should use RECs that are within the same market boundary as described in section 2.3 Claiming renewable electricity use: the market boundary criteria, e.g. if you have operations in North America, you are expected to use RECs (USA and Canada) and not Guarantees of Origin (GOs), which are the instruments used in Europe. Likewise, your European operations are expected to use GOs and not North American RECs or other instruments from other geographies. **Unlike offsets, electricity tracking instruments are not expected to become global commodities, but regional commodities**. This is because there are physical restraints to the transmission of electricity that should be respected by the tracking instrument trade. A good example is the case of islands, for example Iceland. There is no connection between Iceland and mainland Europe. As such, buying Icelandic GOs as a supply of European based consumption is seen as a problematic practice. These considerations could be extended to reflect transmission capacity between countries, which could add layers of complexity that, at the current stage of development of the system, are still difficult to address. The best way to address them is to source renewable energy from local renewable sources.

Can I use UK green tariffs in order to account for lower Scope 2 emissions?

Yes, depending on the tariff chosen. Some tariffs are 100% renewables, some are not, but the supplier has the obligation to inform the customer about it.

Can I use an emission factor provided by my supplier?

Yes, in your market-based Scope 2 figure.

Where can I find corrected emission factors for the grid?

The AIB has calculated corrected grid emission factors for all EU countries.

I purchase offsets that are based on renewable energy generation, can I account for these in my Scope 2 figure?

No. In this case the origin of the offsets doesn't really matter. According to the GHG Protocol Corporate Standard, offsets should be reported as separate information from the gross emission figures that Scope 1, 2 and 3 represent.

You can report your use of offsets in questions C11.2 and C11.2a where you can provide details of any project-based carbon credits originated or purchased within the reporting period as well the purpose of those purchases.

Can RECs/GOs/IRECs/TIGRs be reported in C11.2?

Question C11.2 only applies to companies that have originated the carbon credits or who have purchased them for the purposes of compliance or as voluntary carbon offsets. For the most part, this question applies to Clean Development Mechanism projects that are in the pipeline and are not yet approved. Therefore, they cannot be reported here.

If we purchased more RECs than the amount of energy we actually consumed (1 REC= 1MWh), can we then enter a negative Scope 2 figure?

No. RECs are not offsets – they are a way to attribute a company's energy purchase to a renewable source and claim the low carbon benefit. That is why RECs are a regional product - the energy used should be in the same market boundary as the energy produced and represented by the certificate. Even if they were offsets, in accordance with the GHG Protocol, CDP asks companies to report on gross emissions that do not take offsets under consideration. None of the emission fields in the online response system will allow a negative response for this reason.

We operate in a country that has 100% electricity from hydroelectricity. How should we report this?

If the fuel mix in your national grid has a large proportion of renewable energy, then naturally your carbon emissions per MWh are going to be lower than in countries that have a higher proportion of fossil fuel-based sources in the grid mix, and therefore your Scope 2 emissions calculated with the location-based method will be low. However, you should not report renewable energy usage which is sourced from grid mix as active renewable energy procurement.

In countries where contractual instruments do exist, companies should report Scope 2 (market-based) emissions using the emission factor provided by the contractual instruments, or the residual mix emission factor. If your company is not directly purchasing energy from renewable energy providers, you should be using the residual mix emission factor. Only in countries where contractual instruments or residual mix emission factors do not exist, can companies use the grid average emission factor.

6. Worked examples

Example 1 – On-site production of non-grid connected renewable electricity owned by another company with no tracking instruments generated.

It is becoming common for a company to supply the space, while another company implements and manages the renewable energy installation that produces electricity. This electricity can then be fed to the company that is providing the space and consumed "on the spot". For the sake of this example we will assume the following energy profile of Company 1:

- It has multiple facilities (remote equipment, e.g. diesel generators) around the world that consume small amounts of electricity, as well as large buildings that are grid connected;
- It has installed solar panels at its facilities in Argentina which are owned and managed by another company; the 15,000 MWh generated by these solar panels are supplied to Company 1 and are subject to an agreement between the two parts which is equivalent to a sale;
- For all other electricity, the company is being supplied by the grid and does not have any special agreements with its suppliers or buy and retire any type of certificates.

(C7.5) Break down your total gross global Scope 2 emissions by country/region.

Country/Region	Scope 2, location-based (metric tons CO_2e)	Scope 2, market-based (metric tons CO_2e)	Purchased and consumed electricity, heat, steam or cooling (MWh)	Purchased and consumed low carbon electricity, heat, steam or cooling accounted in market-based approach (MWh)
United States of America	19,000	22,000	350,000	0
Canada	10,000	11,000	80,000	0
United Kingdom	30,000	32,000	70,000	0
Spain	10,000	13,000	60,000	0
Argentina	10,000	10,000	80,000*	15,000

*This total of 80,000MWh is comprised of 65,000MWh supplied from the grid and 15,000MWh from solar panels.

(C8.2a) Report your organization's energy consumption totals (excluding feedstocks) in MWh.

Activity	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total MWh
Consumption of fuel (excluding feedstock)	HHV	0	1,500,000	1,500,000
Consumption of purchased or acquired electricity		15,000	525,000	540,000
Consumption of purchased or acquired steam		0	100,000	100,000
Consumption of self-generated non-fuel renewable energy		0	0	0
Total energy consumption		15,000	2,125,000	2,140,000

(C8.2e) Provide details on the electricity, heat, steam, and/or cooling amounts that were accounted for at a zero emission factor in the market-based Scope 2 figure reported in C6.3.

Sourcing method	Low-carbon technology type	Country/region of consumption of low-carbon electricity, heat, steam or cooling	MWh consumed accounted for a zero emission factor	Comment
Power Purchase Agreement (PPA) with on-site/off-site generator with no grid transfers (direct line)	Solar	Argentina	15,000	We have established a contract with SolarCompany, a provider of solar energy solutions, where they own and manage all our on-site installations and we buy the electricity from them.

Example 2 – A company purchasing RECs in the USA

Company 1 is a USA based company with installations in Oklahoma, California, Upstate New York and Colorado. It consumes the following amounts of electricity:

	MWh
MROW	200,000
CAMX	150,000
RMPA	40,000
NYUP	30,000
Total USA	**420,000**

Its Oklahoma facility also purchases 100,000 RECs (1 REC=1MWh) from an Oklahoma wind farm. Because this facility is within the MROW eGRID sub-region, when doing its calculations to compute the electricity Scope 2 market-based footprint for MROW it uses the eGRID emission factor for the portion of power it does not have RECs, this is 200,000 – 100,000 = 100,000 MWh. The 100,000 MWh for which it has RECs are computed using the specific RECs emission factor, which in this case because it is a renewable energy source, will be assumed to be 0 t CO_2e/MWh. Thus, the footprint, calculated for each eGRID sub-region will look like the following table:

	Non-renewable MWh	lb/MWh (eGRID 2012)	t CO_2e
MROW	(200,000 – 100 000) = 100,000	1,425.15	64,644
CAMX	150,000	650.31	44,246
RMPA	40,000	1,822.65	33,070
NYUP	30,000	408.80	5,563
Total USA	**320,000**	-	147,523

Thus, compared to the scenario where RECs would not have been bought, Company 1 has reduced its electricity market-based Scope 2 footprint by 64,644 t CO_2e. The organization has also consumed 10,000MWh of fuel (for energy purposes) during the reporting year.

Its CDP disclosure would look like this:

C8.2a: Report your organization's energy consumption totals (excluding feedstocks) in MWh.

Activity	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total MWh
Consumption of fuel (excluding feedstock)	HHV	0	10,000	10,000
Consumption of purchased or acquired electricity		100,000	320,000	420,000
Total energy consumption		100,000	330,000	430,000

C8.2e: Provide details on the electricity, heat, steam, and/or cooling amounts that were accounted for at a low-carbon emission factor in the market-based Scope 2 figure reported in C6.3.

Sourcing method	Low-carbon technology type	Country/region of consumption of low-carbon electricity, heat, steam or cooling	MWh consumed accounted for at a zero emission factor	Comment
Unbundled energy attribute certificates, Renewable Energy Certificates (RECs)	Wind	USA	100,000	Company 1 has bought 100,000 RECs from an Oklahoma wind farm and reflected that in its total Scope 2 footprint provided in C6.3. This led to a reduction of 64,644 t CO_2e from its market-based footprint.