

Green Power Accounting Workshop: Concept Note

For discussion during Green Power Accounting Workshop in Mexico City, May 13th 2011

Introduction

As more companies and government organizations prepare greenhouse gas (GHG) inventories that reflect the emissions directly and indirectly associated with their operations, they increasingly seek ways to reduce or mitigate these emissions. They have pursued internal process changes and efficiency improvements, as well as external instruments such as green power products and offsets. Companies have expressed concern that the variation in these types of products both locally and globally creates challenges in consistently accounting for and reporting these instruments in corporate GHG inventories.

Over ten years ago, the GHG Protocol Initiative (GHGP) at the World Resources Institute provided internationally-accepted standards and guidance in GHG accounting and reporting in the *Corporate Standard*, its foundational publication that has been adopted by reporting programs internationally. Seeking to ensure consistent corporate disclosure within this established framework, GHGP is proposing a criteria framework and set of short and long-term recommendations that will clarify how different types of purchases should be accounted for and reported. Like all of its publications, this guidance will be developed through a global, consensus-based stakeholder process that includes workshops, individual consultations and case study analysis.

This Concept Note is designed to serve as a background document and discussion draft that identifies the core accounting principles and issues for green power purchases, introduces the criteria framework, and explores the accounting options associated with renewable energy (RE) projects that also produce carbon offsets.

I. Accounting for electricity emissions according to the *Corporate Standard*

The *Corporate Standard* categorizes GHG emissions into three “scopes”:

- Scope 1, which includes direct emissions from equipment owned or operated by the company
- Scope 2, which includes indirect emissions from purchased electricity, where the energy generation and emissions occur outside of the company’s GHG inventory boundaries
- Scope 3, which includes indirect emissions from a variety of upstream/downstream sources associated with a company’s supply chain

Most companies purchase electricity from a local grid, and would reflect those emissions in scope 2. However, any emissions associated with on-site energy generation (i.e., diesel generators, PV solar) would be categorized under scope 1, since the company controls those sources. The challenge of estimating emissions from electricity purchased from the grid is that electrons flow indistinguishably to the nearest point of use and consumers generally cannot know which specific energy sources have produced the electrons which they have consumed. Instead, consumers determine the emissions for which they are indirectly responsible through using an **average emissions factor**. The basic formula for

BOX 1: Calculating scope 2 emissions

Consumed MWh	X	Average Emission Factor	=	Total Emissions
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calculating scope 2 emissions as recommended by the GHG Protocol

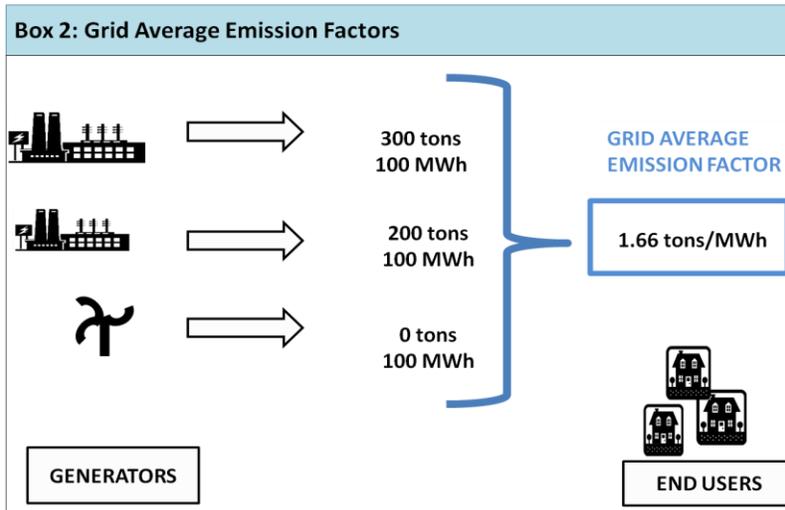
Corporate Accounting and Reporting Standard is described in Box 1.

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a. Average Emission Factors

In principle, average emission factors are a means of allocating generation emissions to end-users. It treats electricity as a “shared resource,” wherein all the emissions created during the process of

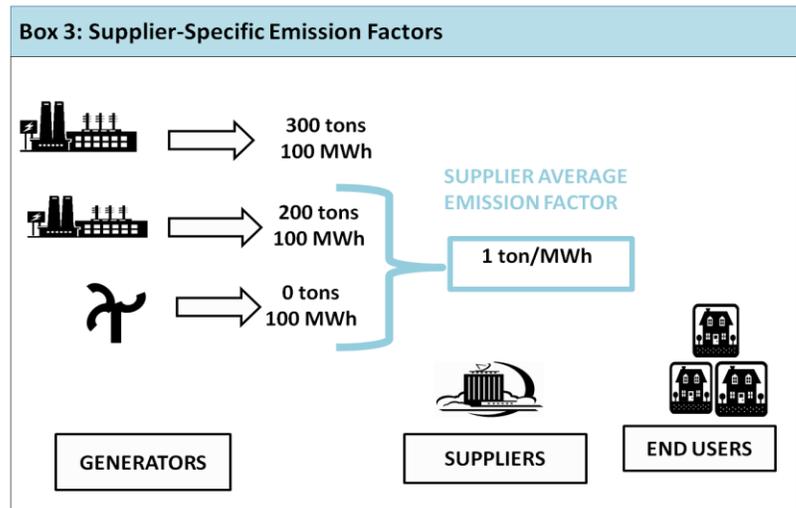


generating a given amount of electricity for the grid are averaged and reported as indirect emissions by all grid users in proportion to their consumption. Consumers multiply this average factor by the amount of electricity they have consumed in order to arrive at an estimate of the total emissions for which they are responsible.

To calculate average emission factors, the total emissions associated with producing electricity from all of the sources

supplying the given are aggregated and then divided by the total amount of energy they have supplied (in MWh or kWh).

The boundaries defining what sources are included in this calculation can vary. For instance, groups like the International Energy Agency have calculated average emission factors that encompass all the generation within a country, while other national government agencies may produce more regionally-specific averages. Some suppliers or utilities use the same procedure for the particular generation sources supplying their portfolio. Box 2 demonstrates a generic average grid emission factor, and Box 3 shows the sub-set of that grid’s generation that could be reflected in a supplier-specific emission factor.



b. Limitations of Average Emission Factor Use in Scope 2

The GHG Protocol’s recommendation has been to select the most accurate and precise average emissions factor that reflects the impact of the electricity locally consumed. While this calculation practice provides a consistent means of tracking electricity emissions, it presents an inherent limitation to users: the emissions profile of the grid is largely out of their control. The average emission factor may become more or less GHG-intensive due to choices and conditions occurring outside of their inventory boundary. One possible alternative to assuming assume this “default” emissions factor, is for consumers to actively select the generation sources – and the related emissions profile and factor – they wish to have associated with their electricity consumption. Significantly, this is what has motivated many companies to pursue RE contracts or purchase other RE products, detailed below.

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II. How are companies purchasing renewable energy?

Companies have identified a number of different mechanisms for purchasing renewable energy, depending on the geographic jurisdiction and specific electricity market. Most markets have opportunities for companies to enter into contracts, or power purchase agreements (PPAs) with renewable energy generators or suppliers. In other markets, RE tracking instruments and certificates have provided a means for companies to purchase and claim RE characteristics or “attributes” in a way that is de-linked from the underlying electrons. Many countries have created markets for Renewable Energy Credits (RECs) both as a regulatory means to track qualifying generation for supplier-obligation policies, as well a tool to support greater voluntary corporate purchases.

To serve these different policy goals, these instruments are defined as containing different types of information, characteristics and “attributes.” Critically, these attributes have not been systematically defined, nor have most policies or programs established mechanisms to ensure that only one given entity (suppliers or end-users) has claimed the attributes. Still other programs and policies have set eligibility restrictions on whether and how these characteristics can be obtained, bought/sold or used for corporate energy or GHG claims. These three elements—attributes, ownership and eligibility—form the basis of the proposed criteria framework for evaluating how these instruments and purchases should be reflected in a GHG inventory and are discussed below.

III. Criteria framework for ensuring accurate and robust accounting

In order to ensure that the given renewable energy purchase is accurately reflected in a GHG inventory, several questions need to be addressed.

a. Attributes

RE has several characteristics which make it more environmentally and socially preferable as compared to conventional sources. But identifying specific characteristics, or “attributes,” that are contained in a given instrument is critical in determining how to account for it in the GHG inventory. Three primary types of information that are conveyed by renewable energy instruments:

1. Emission rates

All energy inherently carries the “attribute” of the emissions associated with its generation, or its emission rate. This is the information that is implicitly contained within **average emission factors** that end-users utilize for scope 2 estimations. The emissions rate or profile for RE generation is typically 0 tons CO₂e/MWh. For the purposes of GHG reporting, isolating the emissions rate of a renewable energy purchase is an alternative means of attributing generation emissions to a specific end-user/purchaser. Applying the zero emissions/MWh rate to the purchased RE is consistent with the recommendations of several North American voluntary GHG reporting programs, including The Climate Registry and largest voluntary REC certifier/purveyor, Green-e.

2. Avoided emissions

Rather than reflecting the zero emissions rate associated with the operation of renewable energy resource, an “avoided emissions” analysis seeks to estimate the fossil fuel emissions occurring on the rest of the grid that are avoided or displaced by the operation of the renewable energy resource. Where an emission rate approach looks at the emissions associated with the resource’s operation, the “avoided emissions” approach looks at the potential effect on the rest of the grid. RE offset projects are based upon this type of evaluation, and the total avoided emissions impact of a given project is estimated based on a hypothetical comparison to a “baseline” scenario of what would have happened in the absence of the offset incentive for the project.

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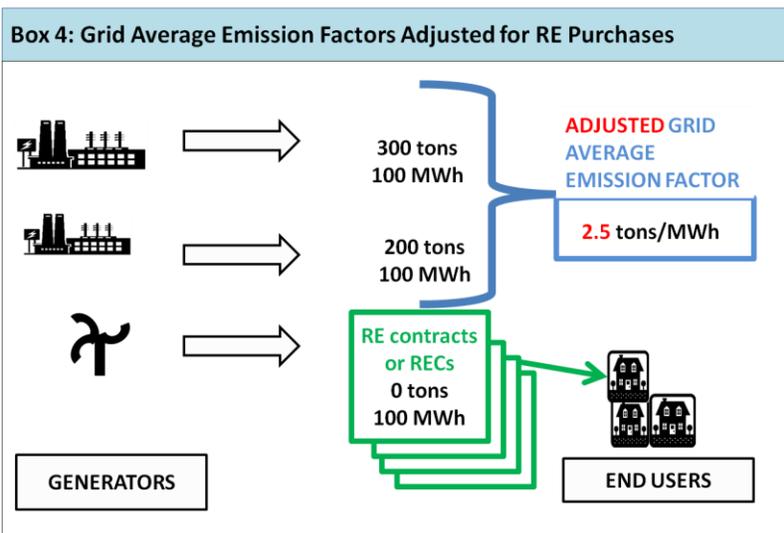
Many in the US particularly have interpreted that this type of avoided emissions impact assessment is applicable beyond just offset crediting – it constitutes an inherent “attribute” associated with all RE. However, where offset crediting requires several quality criteria such as additionality to be met in order to certify the project, and the actual instrument is measured in tons CO₂e avoided. It has less to do with the inherent qualities of the energy than an evaluation of the project’s impact on the rest of the grid. Conceptual and methodological challenges make the application of this “avoided emissions” attribute approach problematic. More is contained in Appendix A regarding the other types of emission factors and methodology used for this type of analysis.

3. Proof of Generation

Many electricity policies, including everything from subsidy programs to supplier obligations, requires a proof of generation certifying that one MWh of energy from a qualifying resource has been added to the grid. These tracking instruments or certificates are generally not designed to contain emissions attributes and would therefore not impact the emissions profile associated with the energy.

b. Ownership

The emissions represented in the grid average emissions factor (the numerator) are not “owned” by the consumers who report them as indirect emissions: they are the direct scope 1 emissions of the generators on the grid. However, if RE purchases are intended to convey emission rate attributes, then ideally only one company would be able to uniquely make a claim about that attribute. For any of these instruments to fulfill their intended applications, all relevant actors along this supply chain would need to recognize and utilize reliable systems that can support specific claims by purchasers and prevent double counting between end-users. Much work has been done on how various energy tracking systems and instruments might work collectively to enhance the transparency of the energy supply chain from generator to consumer, including two primary mechanisms of adjusting grid averages to reflect RE purchases as well as utilizing regional and supplier-oriented tracking mechanisms as part of a larger emphasis on supplier-based disclosure.



Adjusting Grid Averages

Unless the grid averages are adjusted to “remove” the emissions rate associated with the RE purchase, its emission rate attribute still contributes to the GHG grid average, constituting “double counting” of the emission rates. The basic principle is elaborated in Box 4.

Several technical challenges would need to be addressed to execute this adjustment, including identifying what entity or agency

would be best positioned to conduct this adjustment, as the organizations publishing emission factors do not typically have access to the green power market transactions occurring in individual regions.

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Several organizations have noted that while the adjustment of emission factors could theoretically bring greater transparency and accuracy to renewable energy transactions, the small percentage of renewable energy purchases relative to the total grid energy supply makes this adjustment inconsequential. Further, the time delays present in publishing average factors (particularly in the U.S.) calls into question whether the data-gathering structures themselves would be capable of synchronizing claims with the year adjustments.

Other Tracking Mechanisms

Some jurisdictions in the US and Europe have designed registries at a regional level that explicitly track energy generation attributes for supplier-disclosure purposes, which can take into account energy contracts and other RE purchase mechanisms. In these systems, grid end-users could use the emission factors associated with the supplier in their region to estimate the emissions from any grid-consumed energy, and be assured that the numbers that supplier uses already include an “adjustment” of factoring out other RE instruments or contracts.

c. Eligibility

Even if the prior two conditions of attribute clarity and ownership are met, the local jurisdiction or program may set limitations or requirements around what types of projects may be eligible or appropriate for voluntary corporate GHG or RE claims. These eligibility criteria may be based upon larger electricity policy objectives such as incentivizing certain technologies or directing corporate investment towards certain types projects. Most renewable energy projects are made possible by a variety of funding mechanisms, including a combination of power purchase agreements as well as tax or subsidy incentives, and some jurisdictions may wish to prevent corporate end-users from claiming the zero-emissions profile from a project which was primarily supported via public subsidies, in order to ensure that the “benefit” of the project’s low emission rate is shared among all of the end-consumers or rate payers who indirectly paid for it. Moreover, jurisdictions may also wish to meet consumer expectations that corporate renewable energy purchases “makes a difference.” Satisfying this expectation, while not strictly necessary for accurate renewable energy accounting, can be important in building consumer confidence and thereby strengthening renewable energy markets.

IV. Proposed Reporting Treatment of the Emissions Rate Approach

As demonstrated in the 3-part criteria framework above, the emissions rate approach fits most consistently within the GHG Protocol’s recommendation for scope 2 to reflect accurate attribution of generation emissions to end-users – assuming that unique ownership can be shown, and that the project meets the eligibility recommendations or requirements of the local jurisdiction or program. The following demonstrates the reporting practice of reflecting 100 MWh of grid-consumed electricity both with an average emissions factor and reflecting an RE contract for 100 MWh of power:

GRID-AVERAGE

$$100 \text{ MWh} \times 1.66 \text{ tons CO}_2\text{e/MWh} = \mathbf{166 \text{ tons CO}_2\text{e}}$$

“ADJUSTED” EMISSIONS CALCULATED WITH 100 MWH ZERO-EMISSIONS RE

$$100 \text{ MWh} \times 0 \text{ tons CO}_2\text{e/MWh} = \mathbf{0 \text{ tons CO}_2\text{e}}$$

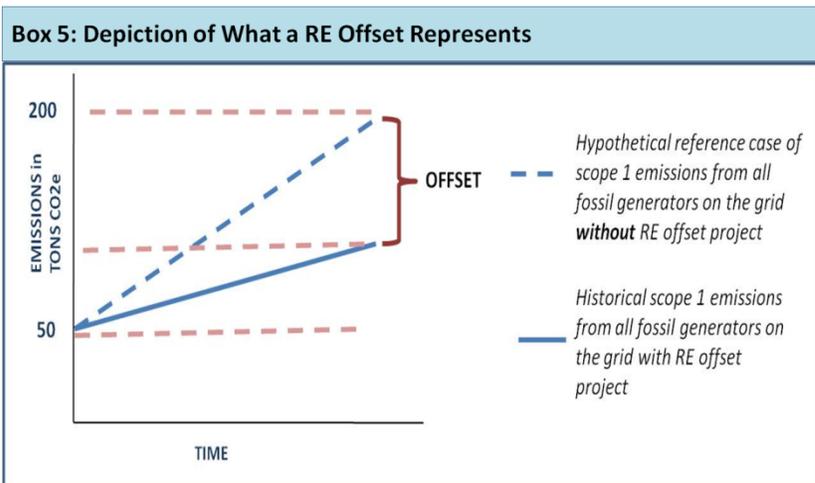
Many reporting programs require that both the grid-average estimated scope 2 be reported along with the RE contractual adjustment. Some have specified that the grid-average number represents “gross emissions” while the adjusted number represents “net” emissions. Transparently documenting the methodology and assumptions that go into the calculation, as well as the extent to which the purchase/contract meets ownership and eligibility requirements, can assist readers of the inventory in fully understanding the nature of the project and the contract.

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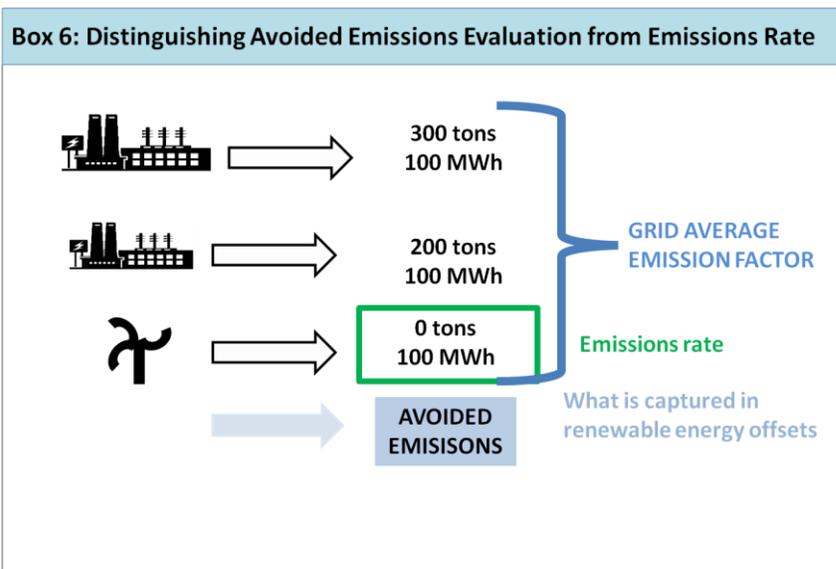
V. Overlapping attribute claims: CERs and RE purchases

Every energy source feeding the grid can be said to carry an emissions factor (i.e. to have a specific emissions profile); renewable energy offset projects would be no different, regardless of whether they are from projects that receive offset credits that represent avoided emissions compared to baseline scenarios. The GHG definition of an RE offset are depicted in Box 5 below.



If the zero-emissions rate from RE projects are not isolated/”sold separately” through an RE contract or RE certificate, they typically would otherwise blend into the grid average for their region and all grid consumers share the “benefit” of a less GHG-intensive average emission factor. In other words, the emissions-rate “impact” of credited offset projects may already be partially reflected in the less GHG-intensive emission

factor that is used by grid consumers in calculating their scope 2—unless that rate is not included in the average emission factor to begin with. This relationship is demonstrated in Box 6 below.



Some have found it problematic that a single project can potentially provide two separate commodities—an offset and an RE emissions rate—feeling that the benefits of the project are “double counted.” Some options about how to handle the emissions rate of an RE project are detailed below:

1. The emissions rate of the RE is kept in grid average, but not available for unique corporate claims

Some stakeholders have expressed preferences (largely as a matter of equity or **eligibility** rather than accounting technicalities) for the concept of the emissions rate being shared by all grid users rather than be isolated and made available for individual sale.

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2. The emissions rate of the RE is factored out of the grid average

Another approach would be for *no entity*, whether individual or collective, to use the emissions rate from the RE offset project. In essence, this means that all the grid users would use an emission factor calculated to reflect grid conditions without the RE offset project. This may pose a host of technical challenges, including whether to “factor back in” the emissions rate after the duration of the RE offset’s crediting period, and whether at that time the emissions rate might also become available for use in GHG inventories. Fundamentally, if scope 2 requires a correct attribution of generation emissions to end-users, removing a project from the average leads to more GHG-intensive emission factor than what the actual grid demonstrates.

3. Generator adds back in tons of CO₂e contained in offset to their scope 1 inventory, thereby changing the total emissions used in calculating the grid average

Some programs recommend that the offset generator “add back in” the offset to the generators’ scope 1 GHG emissions inventory, so as to maintain the global integrity of the accounting. This would mean that a wind farm producing an offset would then report the offset’s emissions in its own scope 1 category, even though the wind farm has technically produced no emissions as part of its generation. There is also concern that adding back in the offset quantity to the generators’ scope 1 would technically require a change in the grid average emission factor, to ensure accurate attribution of reported scope 1 generation emissions to end-users.

While these adjustments may create a more technically correct global reporting format, the practical implementation has not been thoroughly explored by most local jurisdictions, particularly given the estimated nature of grid average emission factors and the more fundamental lack of data availability. Still, these adjustments could still be consistent with a specific end-user claiming a zero-emissions profile of the RE.

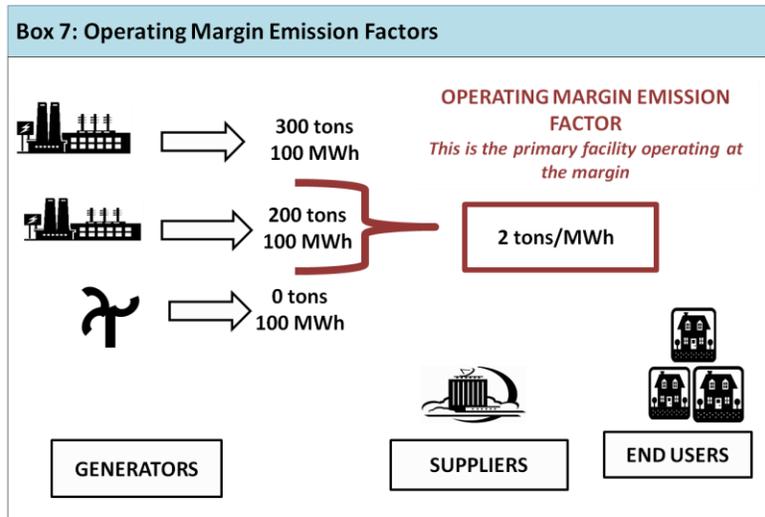
VI. Summary and Recommendations

Based on the proposed Attributes, Ownership, Eligibility framework, it would appear that renewable energy purchases in Mexico would need to address the following issues:

1. Attributes:
 - Clarify what attributes RE contracts or other certification methods convey \
2. Ownership:
 - Clarify whether and how the zero-emissions rate attribute from RE purchases generation emission attributes are conveyed to all relevant grid end-users
 - Clarify how grid average emission factor would be adjusted for various RE contracts/certificates
3. Eligibility:
 - Clarify whether the local Mexico electricity/policy jurisdiction has set conditions, restrictions or recommendations around claiming the emissions rate from a project in a corporate GHG inventory
 - Clarify whether the offset program (CDM) has recommended conditions/restrictions associated with using the emissions rate attributes from a given project.

Appendix A: Operating and Build Margin emission factors

Many companies are familiar with average grid emission factors in the context of completing their GHG inventory, but have also had experience in developing energy production or conservation projects that use other emission factors in the GHG impact evaluation. Some of these projects include RE offsets, co-generation units and efficiency/retrofit projects. Where average grid emission factors characterize the



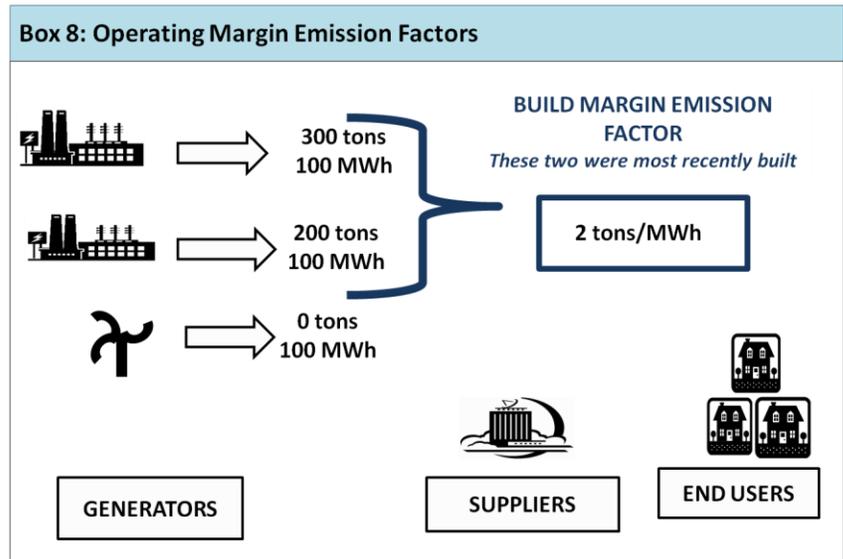
emissions profile of the total generation of the given grouping, other types of emission factors can reflect sub-sets of generation. For estimating the impact of these projects, operating and build emission factors are often used.

The “operating margin”¹ relates to the types of generation sources that are the dispatched on the margin. Energy generation sources do not all run at the same time, but are dispatched in particular orders to meet the different energy demands

throughout the day. That order is impacted in part by the physical qualities of the energy and its reliability, as well as the cost of those resources. When any new generation source is added to the grid, that order –and in turn the total generation and emissions associated with supplied grid energy – is impacted. Estimating these “avoided” emissions requires an assessment of which generation sources’ operations are displaced. This is demonstrated in Box 7.

The “build margin” is also estimated as part of evaluating what other types of generation would be built to meet the growing demand.

The build margin is generally estimated based on what other generation sources were most recently added, as depicted in Box 8.²



¹ As defined by the *GHG Protocol Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects*, the operating margin includes the “set of existing power plants whose output is reduced in response to a project activity. These power plants are the last to be switched on-line or first to be switched off-line during times when the project activity is operating, and which therefore would have provided the project activity’s generation in the baseline scenario.”

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The combination of the operating margin (OM) emission factors and build margin (BM) emission factors are used to estimate the total impact of the project compared to the baseline. Even outside of an offset crediting scheme, some project developers and end-users have been interested in knowing the impact of a new RE project on the grid, and would use these emission factors to carry out the estimation. Unlike **average emission** factors, **marginal emission factors** reflect the emissions profile of a select sub-set of electricity generation facilities based on their role in the dispatch order of the system. Marginal emission factors are not used as a means of attributing generation emissions to end-users for scope 2 purposes, but are instead generally used for estimating avoided/displaced emissions compared to a baseline.

² As defined by the *GHG Protocol Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects*, the build margin includes “the incremental new capacity displaced by a project activity. The build margin indicates the alternative type of power plant (or plants) that would have been built to meet demand for new capacity in the baseline scenario.