Scope 2 GHG Emissions Accounting for Electric Power Companies

This Program 201 back-pocket-insight (BPI) describes how electric companies can account for indirect "Scope 2" greenhouse gas (GHG) emissions as part of a corporate GHG emissions inventory. This is the second BPI in a series designed to help electric companies and other entities conduct comprehensive GHG emissions accounting. It is based on 2021 research completed by P201.[1]

GHG Emission Scopes

The first BPI introduced GHG emissions "scopes." Direct emissions, referred to as "*Scope 1,*" result from company activities that physically release (or remove) GHGs to the atmosphere, such as burning natural gas to generate power. *Indirect* emissions can be classified either as *Scope 2* or *Scope 3;* they result from company-related activities but are not directly emitted by the company. There are two types of Scope 2 emissions relevant to electric companies.

Purchased Electricity for "Own" Use

First, Scope 2 emissions are associated with electricity, heat, steam, and cooling purchased by an electric company (or any other entity) to power its own operations.

An electric company reporting these Scope 2 emissions would account only for the emissions associated with the portion of power generation they purchase from other entities and consume to power their own buildings and related infrastructure. These indirect emissions occur outside of the electric company's reporting boundary and are emitted at a power generation site owned by another party.

Most corporate entities, including electric and non-electric companies, will have this type of Scope 2 emission source, unless they supply 100% of the energy they use from their own power generation sources and do not purchase any electricity, heat, steam, and cooling from other parties.

For most integrated electric companies this source of Scope 2 emissions typically is very small compared to a company's Scope 1 emissions. For many commercial and industrial customers, however, this type of Scope 2 emissions often is one of their largest GHG emissions sources.

Transmission and Distribution System Line Losses

A second type of Scope 2 emissions is relevant to electric companies that own and operate bulk transmission and local distribution (T&D) systems. When electricity (MWh) is transmitted from generators to grid-connected end users through T&D systems, a portion of the electricity transmitted is "lost" as it passes through wires and equipment. These are referred to as "T&D line losses." Typically, T&D line losses are a small percentage (~3-7%) of the total amount of power transmitted and/or distributed across a power system.

For electric power companies that both generate power and transmit it across T&D infrastructure they own, the GHG emissions associated with T&D lines losses typically are reported as part of the company's Scope 1 emissions associated with power generation and are not reported separately.

Electric Company Structure and Indirect T&D Emissions

An electric company's corporate structure impacts the correct categorization of T&D losses. Table 1 shows how to categorize T&D line losses for different types of electric companies.

Table 1: Electric Company T&D-related GHG Emissions

Corporate Structure	Does Corporate GHG Emissions Inventory Include Scope 2 T&D Line Losses?
Vertically Integrated Electric Company	1. No – for self-generated power, as these emissions are accounted for in Scope 1. T&D losses are not indirect for the company. 2. Yes – for wholesale power purchased from other parties and transmitted and/or distributed (e.g., wheeled) across the company's T&D system.
Generation & Transmission Cooperative	Same as above, but line losses are limited to the bulk transmission system only, unless the G&T also owns and operates the local distribution system(s).
T&D companies ("Wires Only")	Yes. GHG emissions associated with T&D line losses for all electricity flowing through the company's system would be included.
Independent Power Producer (IPP)	No. IPPs do not own or operate T&D equipment. Any indirect emissions associated with T&D line losses from purchased power for "own" use of electricity are categorized as Scope 3.

Both vertically integrated power companies and generation and transmission cooperatives own and operate power generation facilities, so they report direct Scope 1 emissions from power generation. Although these entities also own and operate transmission lines, GHG emissions from T&D losses from these companies' perspective are not indirect and are reported by these entities as part of their Scope 1 emissions.

However, if these same entities purchase some portion of electricity from another company and only provide transmission services to deliver (i.e., "wheel") it across their lines to another unaffiliated party – without consuming it themselves – they can account for the GHG emissions associated with the T&D losses either as Scope 2 or Scope 3 emissions. Accounting for these indirect emissions within Scope 2 may be valuable as it

[1] *Greenhouse Gas Emissions Accounting for Electric Companies: A Compendium of Technical Briefing Papers and Frequently Asked Questions*. EPRI, Palo Alto, CA: 2021. 3002022366.

distinguishes an emissions source that the wheeling electric company has a greater ability to impact (e.g., through improvements to the T&D system).

Similarly, if a vertically integrated power company or generation and transmission cooperative purchases power for resale to other energy providers or to end-user customers — rather than consuming the power in their own operations — the company can report all of the GHG emissions associated with the purchased power as Scope 3, or it can split these emissions between scope 2 (line losses associated with transporting the power to an end-user) and scope 3 (remaining emissions associated with the purchased power).

The indirect emissions associated with any "upstream" T&D line losses associated with this purchased energy would be Scope 3 for the power company buying and using the power. The indirect emissions from any "downstream" line losses associated with moving this power through the T&D system(s) to the end-user already would be accounted for within the total quantity of power purchased for end-users.

Electric companies that only own and operate T&D equipment and do not generate electric power (i.e., "wires only" companies) report the GHG emissions associated with "line losses" from transmitting electricity from power generators to load-serving entities (LSEs) and end-users. This type of Scope 2 emissions is unique to these types of electric companies.

A company that owns and operates only power generation facilities, such as an independent power provider, typically does not report Scope 2 emissions associated with T&D losses, but they may report other Scope 2 emissions for energy they purchase from third parties for their own use. Any emissions from T&D losses associated with electricity these entities purchase would be categorized as Scope 3**.**

Calculating Scope 2 Emissions

Scope 2 emissions for electricity purchased and consumed by a company typically is calculated by multiplying an estimate of the amount of electricity purchased and consumed (MWhs) by an appropriate GHG emissions factor (EF) that relates CO_2 emissions to power generation (tCO_2/MWh). Typically, Scope 2 EFs are limited to including only carbon dioxide (CO_2).

To calculate emissions from purchased electricity, the EF applied should be the "emission factor at generation" (EFG) rather than the "emission factor at consumption" (EFC), where the EFC is a function of EFG and T&D losses. The difference between the two is an EFC includes T&D losses within its emissions rate while the EFG does not.

Often companies report Scope 2 "purchased energy" emissions based on an average annual regional grid EFs published by the US EPA or other federal and state agencies that provide an average emissions rate electricity consumed across a large geographic regions and smaller sub-regions. While many entities rely on these regional average EFs to calculate and report their Scope 2 emissions, these EFs have important shortcomings, including: (i) data reporting time lags which make it impossible to accurately reflect the ongoing rapid change in the composition of the power generation fleet; and (ii) they do not accurately reflect actual emissions at the time or location the emissions occurred and so may under or over-estimate actual emissions.

Location & Market Methods to Estimate Scope 2

Under existing corporate voluntary GHG accounting standards[2], companies can report these Scope 2 emissions using either a "locational" and/or a "market" approach.

The *location-based* method reflects the average GHG emissions intensity of the power grid in which energy consumption occurs. This type of EF is based on the physical flow of electricity in the regional grid.

The *market method* reflects emissions from the electricity end-use customers have procured by contract or using other types of financial arrangements. This approach has incentivized large C&I and other power customers to purchase large quantities of renewable energy credits (RECs) and renewable energy via power purchase agreements (PPAs). The use of market-based EFs has been questioned by some observers and has led some companies to seek to match their hourly load with "hourly" RECs, and others to begin procuring 100% "carbon-free energy" to meet their load on a 24/7 hourly basis (24/7 CFE).

Calculating T&D Line Loss GHG Emissions

As discussed above, "wires-only" electric companies who own and operate T&D infrastructure account for indirect GHG emissions associated with T&D line losses as Scope 2.

These T&D line loss emissions can be calculated in two steps. First, calculate the amount of line losses (MWhs) by multiplying the amount of electric power conveyed or purchased (MWh) by an estimate of the percentage of expected line losses across the T&D grid(s) used.

Second, multiply the total estimated line losses (MWhs) calculated in step 1 by an appropriate EF that reflects the CO_2 emissions intensity of the electricity flowing in the local / regional power grid (tCO_2/MWh).

This approach also can be used by end-use customers that do not generate the electricity, heat, steam, or cooling that they purchase to operate. The indirect emissions associated with the T&D line losses associated with this purchased electricity are considered Scope 3 for these end users.

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[2] For example, see *WRI/WBSCD Revised Corporate Standard* (2004) .