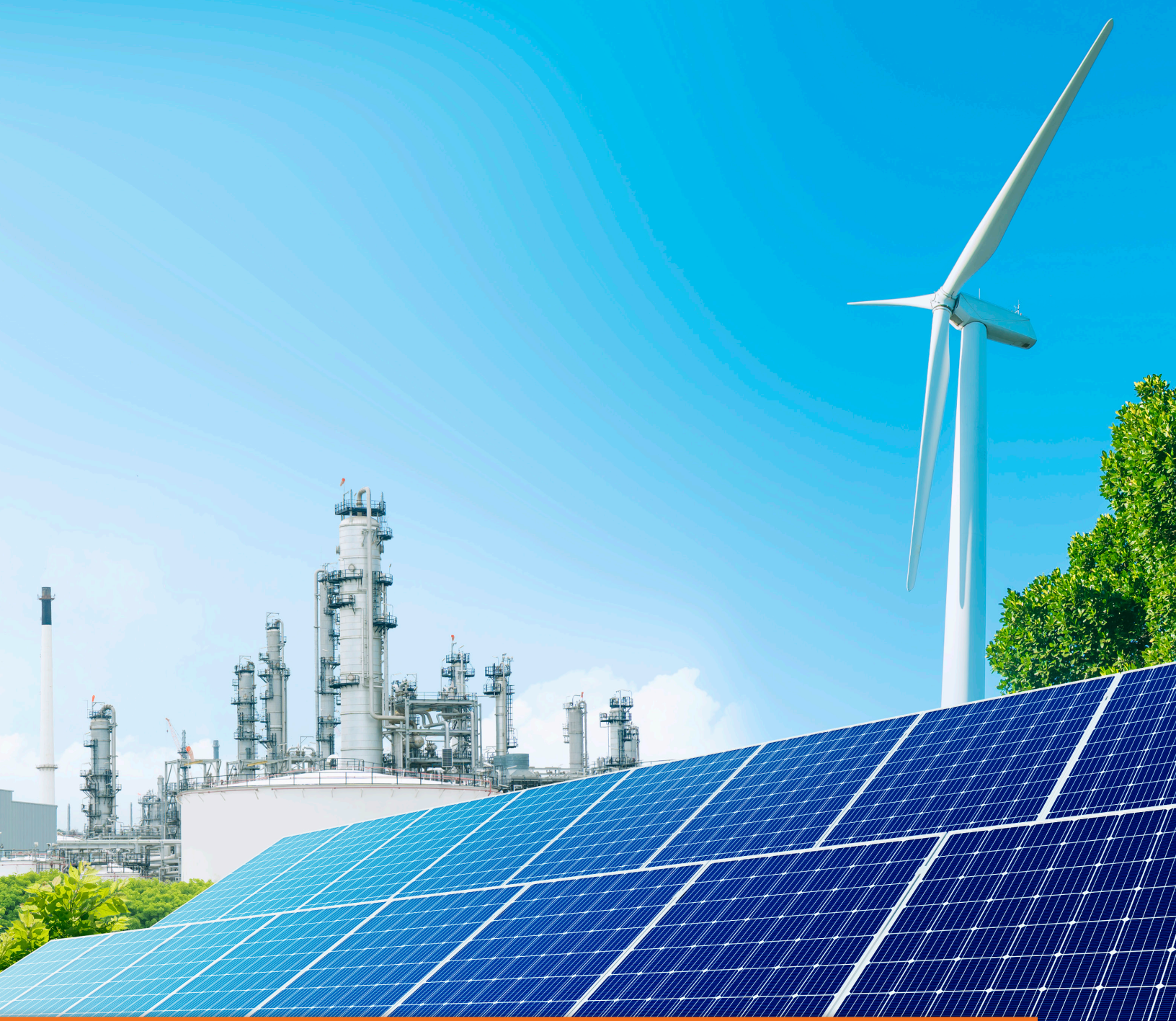

Best Practices for Power Source & Emissions Disclosure

MARCH 2026

CEAP | CLEAN ENERGY ACCOUNTING PROJECT

CRS™

Acknowledgements

Advisory Committee

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Working Group

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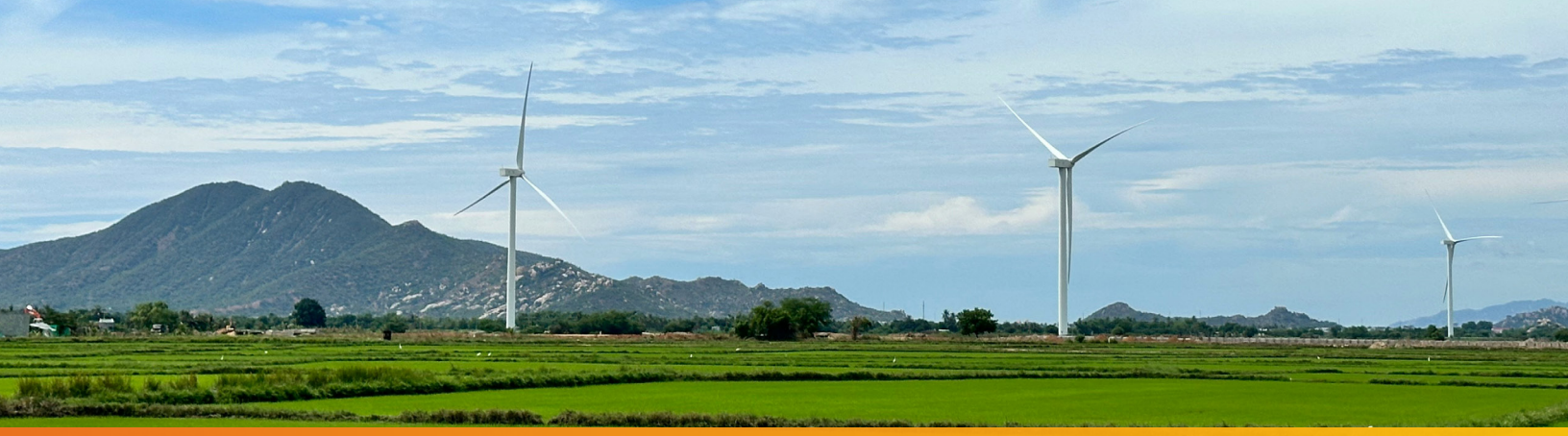
While we deeply appreciate their contributions, the final content presented in this guidance is solely the responsibility of CRS and does not necessarily reflect the views of individual Working Group members or their affiliated organizations.



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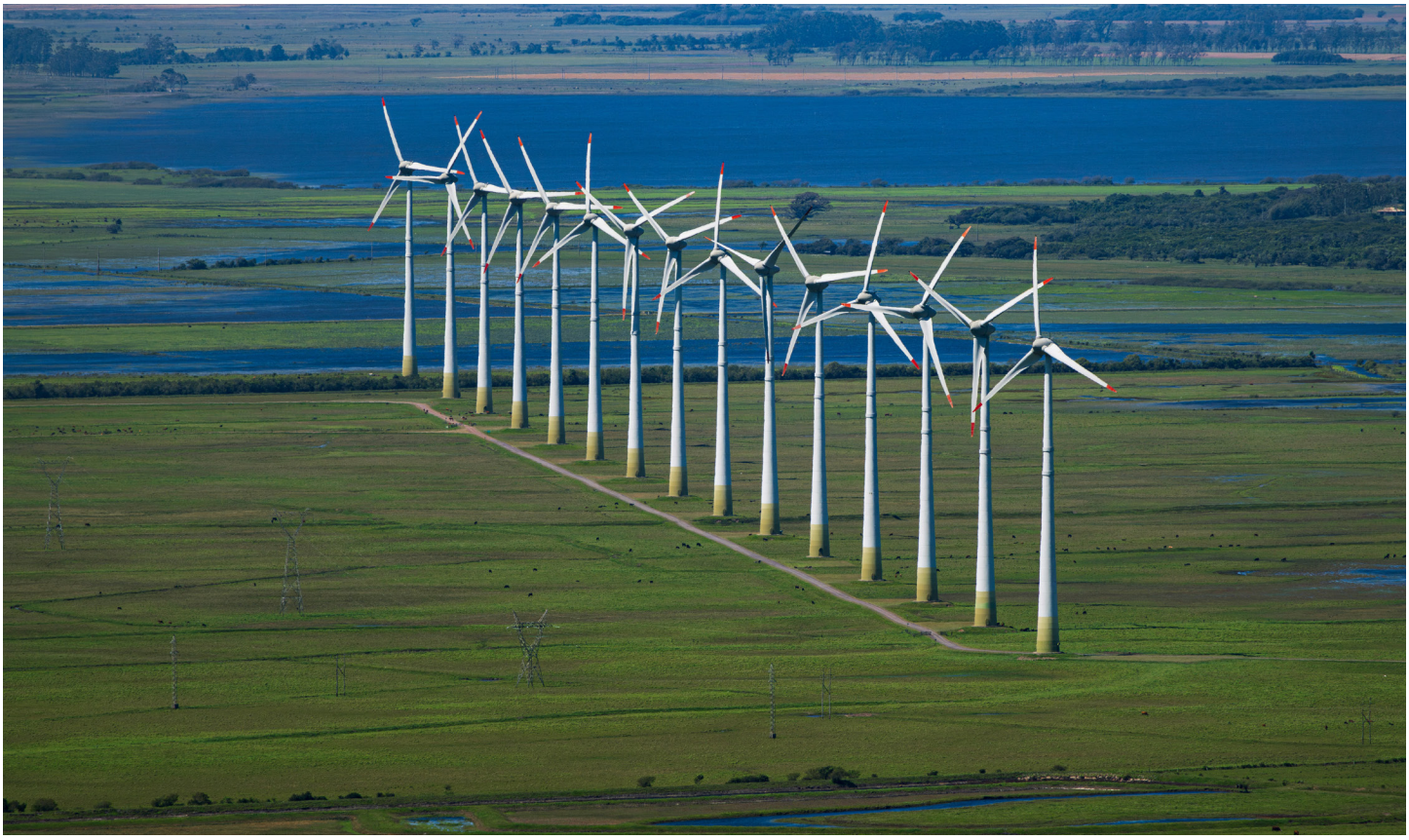
Executive Summary

Purpose and Audience

This guidance provides best practices for Power Source Disclosure (PSD) in the United States. It is intended for regulators, utilities, electricity suppliers, and market participants who are working to strengthen the accuracy, transparency, and credibility of electricity source and greenhouse gas (GHG) emissions disclosures. The document also serves stakeholders in the voluntary market, ensuring that customers receive consistent and actionable information about their electricity purchases.

This guidance establishes consensus-based best practices for utilities and electricity suppliers to implement standardized, transparent, and accessible PSD requirements. The following recommendations represent the minimum expectations for disclosing power sources of purchased electricity. Power source disclosure is often presented through a Product Content Label (PCL), sometimes referred to as a Power Content Label. A PCL is a standardized disclosure tool—typically a simple, customer-facing label or table—that provides information on the resource mix and associated GHG emissions of a specific electricity product or portfolio. While this guidance focuses on the calculations and methodologies that inform the resource mix and emissions presented in PCLs, it is not intended to serve as comprehensive guidance on product design, procurement, sales, or marketing.[1]



1 Best practices for disclosure describe how suppliers calculate and communicate electricity sources and emissions in a transparent, standardized way. Best practices for product design, by contrast, concern how electricity products are structured or marketed—for example, bundled vs. unbundled, time-matching, or certification standards. Product design guidance is governed by voluntary market programs such as Green-e® Energy, not by this disclosure framework.

Accurate PSD enables customers to understand their electricity use and purchases, compare offerings across suppliers and products, and evaluate their role in supporting decarbonization. It also provides regulators with a consistent basis for oversight and tracking progress toward clean energy goals. These recommendations serve as an adaptable, implementable framework for effectively communicating electricity sourcing to both customers and regulators.[2]

Why This Matters Now

The U.S. retail power landscape is vast and fragmented; roughly 3,000 electric utilities/LSEs serve customers nationwide, each operating under different state policy and disclosure regimes.[3] Disclosure rules are likewise uneven: as of 2025, 25 states have generation disclosure (PSD/power content label) requirements.[4] Meanwhile, resource standards are expanding and diversifying: 28 states plus the District of Columbia have a Renewable Portfolio Standard (RPS), and 16 states have Clean Energy Standard (CES) policies (many overlapping with RPSs), raising the stakes for comparable, auditable disclosure.[5]

Adopting the best practices outlined in this guidance will:

- **Foster National Consistency:** Beyond individual programs, PSD can help drive consistency and harmonization across states and regions, improving comparability and reducing confusion for customers, regulators, and market participants alike.
- **Enable Valid Voluntary Claims:** Clear, standardized disclosure supports corporate buyers and voluntary market participants in making valid electricity consumption and emissions claims, advancing decarbonization goals and building consumer trust.
- **Strengthen Policy Insight:** While PSD is designed to serve customers, it also provides regulators with reliable, comparable data to evaluate how existing policies are shaping delivered electricity. If PSD does not accurately reflect state "load-based" programs—such as RPS—it can lead to misinformed policy decisions.[6]

Key Recommendations

- **Delivered Attributes, Not System Mix:** PSD should capture the generation attributes sold and contractually delivered to retail customers. This means reflecting all purchases and transactions made by an electricity supplier for specific customers, rather than showing an overall utility system mix prior to contractual adjustments. End-users should see the energy attributes they are entitled to claim through purchases, contracts, and ownership of generation and energy attribute certificates (EACs), including renewable energy certificates (RECs).
- **Comprehensive Tracking Systems:** Adoption of all-generation tracking systems is recommended to provide the most accurate and consistent PSD. This ensures consistent tracking of all generation,

2 Examples of voluntary market PCLs can be found in the *Green-e® Energy Code of Conduct*: https://www.green-e.org/wp-content/uploads/2025/12/Green-e-Energy-Code-of-Conduct.pdf.
Regulatory examples can be seen on the California Energy Commission's Power Content Program: https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label.

3 U.S. Energy Information Administration. Investor-owned utilities served 72 % of U.S. electricity customers in 2017. August 15, 2019. https://www.eia.gov/todayinenergy/detail.php?id=40913

4 Database of State Incentives for Renewables & Efficiency® (DSIRE), "Generation Disclosure," U.S. Department of Energy, NC Clean Energy Technology Center, accessed June 2025. https://programs.dsireusa.org/system/program

5 Barbose, Galen. *U.S. State Electricity Resource Standards: 2025 Data Update*. Ernest Orlando Lawrence Berkeley National Laboratory, August 2025. https://eta-publications.lbl.gov/sites/default/files/2025-08/state_electricity_resource_standards-2025_data_update.pdf

6 Center for Resource Solutions. (2022, November). *Guide to Electricity Sector Greenhouse Gas Emissions Totals* (v1.0). https://resource-solutions.org/wp-content/uploads/2022/11/Guide-to-Electricity-Sector-Greenhouse-Gas-Emissions-Totals.pdf

enables robust residual mix calculations, and reduces the risk of double counting.

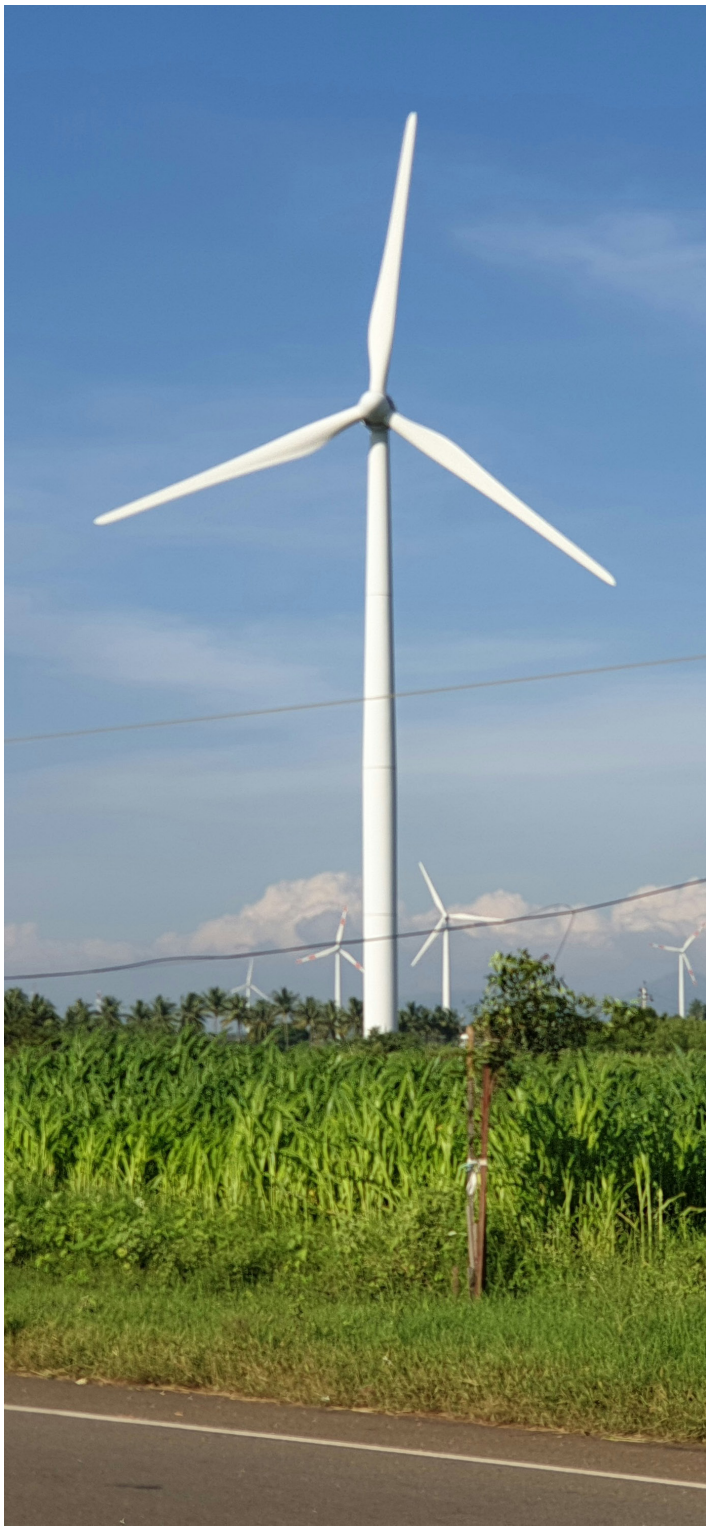
- **Retrospective Reporting with Optional Forward View:** PSD should primarily be backward-looking, based on the retirement of actual certificates that correspond to delivered generation. While forward-looking disclosures may be provided, they should always be supplemented with a subsequent historical disclosure grounded in actual sales and certificate retirement data.

- **Alignment with Emissions Accounting:** Reported GHG emissions should be directly aligned with the disclosed resource mix, ensuring clarity and consistency between delivered generation sources and emissions reporting.

- **Integration of State Load-Based Policies:** PSD should account for state-level load-based policies—such as RPS, CES, or load-based GHG regulations—to ensure that what appears on the disclosure aligns with what customers are legally entitled to claim under these programs.

- **Appropriate Granularity:** The granularity of PSD (e.g., whether attributes are matched to load on an hourly, monthly, quarterly, or annual basis) should be considered separately from the frequency of reporting. This guidance recommends, at minimum, annual matching of generation and attributes to load as the minimum standard for credible disclosure. More granular approaches, such as monthly or hourly matching, may provide additional insights and can be offered as supplemental information, but they should not replace standardized annual disclosure.

This guidance is organized to first establish the core principles that define credible and comparable power source disclosure—such as product-level reporting, alignment with load-based policies, certificate-based accounting, and the treatment of unspecified and null power. It then applies these principles across the major U.S. market and tracking contexts to illustrate how they function in practice. A technical methodology in Appendix A provides clear, step-by-step instructions for calculating resource mixes and emissions. Together, these sections offer both the conceptual foundation and practical tools needed to support accurate, transparent disclosure.

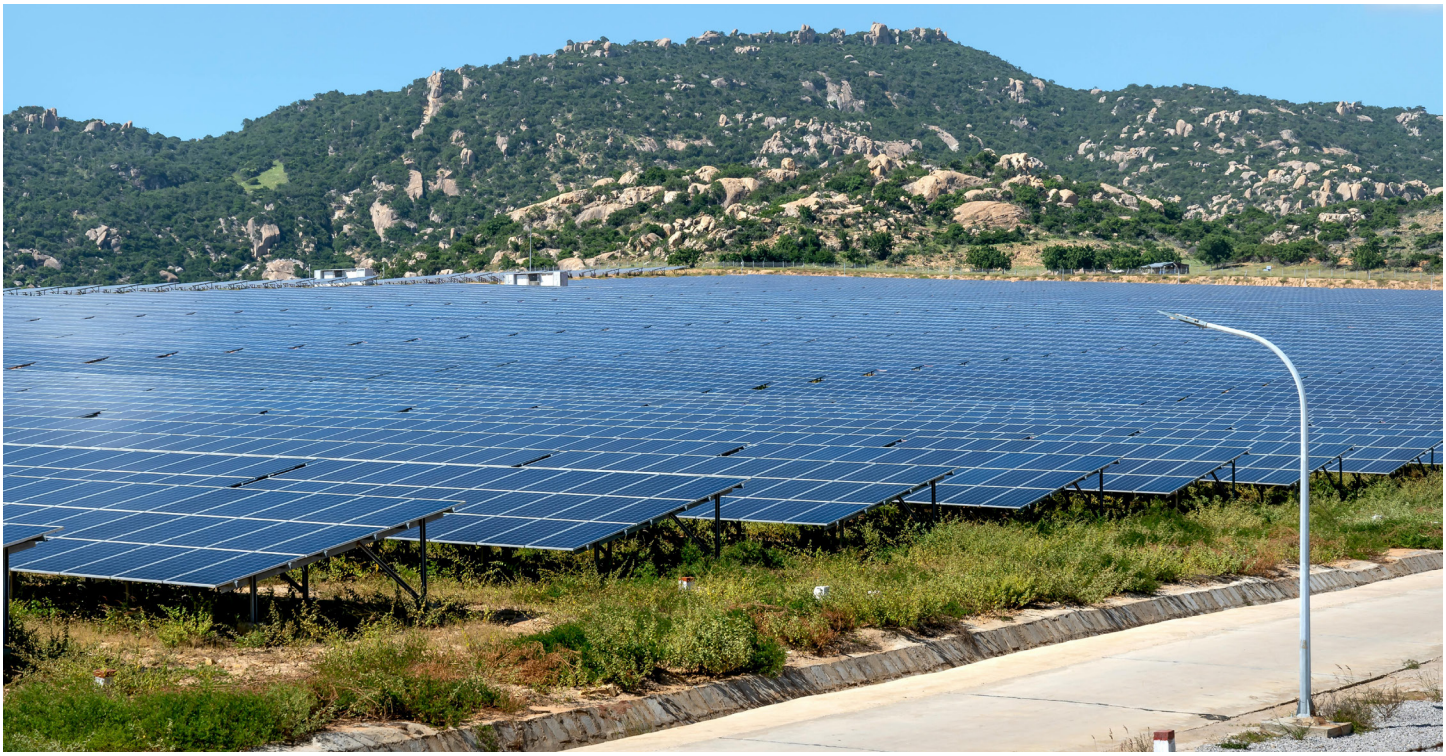


Introduction

All electricity customers deserve clear disclosures about the generation sources they are contractually using and can claim. In the context of this guidance, disclosure refers to the transparent reporting of the resources and emissions associated with electricity sold to retail customers. Effective disclosure helps customers understand how their purchased electricity is produced, what environmental attributes they are entitled to claim, and the broader impact of their energy use. It also enables them to make informed decisions about their electricity purchases, compare suppliers, and evaluate their support for policies that influence the electricity system. **In this way, PSD represents a fundamental right for every electricity consumer.**

Electric utilities in the United States operate within diverse regulatory and market environments that strongly influence how electricity sources and their associated emissions are disclosed to regulators and end-use customers through PSD. While some states mandate power content labeling or environmental disclosure and establish detailed reporting requirements and methodologies, others impose minimal or no requirements.[7] In jurisdictions without explicit PSD mandates, some utilities have implemented voluntary-disclosure practices. The result is that customers often receive inconsistent or incomplete information about the electricity they purchase, even when located in the same region.

The best practices outlined in this guidance address multiple dimensions of disclosure, including the role of energy attributes and contracts, the functionality of certificate tracking systems, and the treatment of unspecified and null power. They also provide guidance on accounting for emissions from both owned generation and purchased electricity. To facilitate implementation, the guidance includes methodologies and examples designed to standardize reporting while allowing for regional flexibility.



7 Center for Resource Solutions. (2025, August). *Best Practices For Power Source and Emissions Disclosure: Background Report*. Clean Energy Accounting Project. Available at: https://resource-solutions.org/programs/ceap/resources/psd/

Core Principles

Effective power source and emissions disclosures require clear communication regarding how electricity and attributes are sourced for retail sales and how associated emissions are calculated. Disclosures should reliably represent the attributes of electricity sold to retail customers, including both specified and unspecified purchases. Employing standardized terminology, calculation methods, and reporting formats enhances comparability across utilities, products, and regions.

Disclosures must also be structured to credibly support "load-based"[8] or consumer-level GHG reporting and broader clean energy policy objectives. Load-based reporting means accounting for the emissions and other attributes associated with the electricity sold to and consumed by retail customers, rather than only the emissions from generation owned or operated by utilities or located in a certain geographic area. This entails alignment with established GHG accounting principles to enable customers to make valid claims and to reinforce measurable progress toward decarbonization. As electricity markets evolve, creating more voluntary products and wholesale market participation, effective disclosure frameworks should provide customers with the tools to consistently and fairly evaluate product offerings.

8 Center for Resource Solutions. (2022, November). *Guide to Electricity Sector Greenhouse Gas Emissions Totals (v1.0)*. https://resource-solutions.org/wp-content/uploads/2022/11/Guide-to-Electricity-Sector-Greenhouse-Gas-Emissions-Totals.pdf

Part I: Best Practice Recommendations

Product-Specific Disclosure

A fundamental principle of PSD is that disclosures must be presented at the product level, not at the utility-aggregate or grid-average level. This ensures they accurately reflect the attributes of the electricity that individual customers receiving the disclosures are buying—and therefore what those customers are entitled to claim. In this context, a "product" refers to a retail electricity supply or resource portfolio, which typically takes three forms:

- **Voluntary products**—offerings customers actively select or voluntarily choose, such as a 100% renewable tariff or a community solar subscription
- **Standard service products**—the standard supply provided to customers who do not make an active supply selection
- **Mixed products**—offerings where customers receive the standard supply for part of their load, while subscribing to a voluntary blend (e.g., 50% renewable)

By focusing on the product level, PSD ensures that renewable energy and emissions claims are directly linked to the specific contracts and attributes underlying what customers purchase, rather than to grid or utility averages that obscure these distinctions and prevent customers from fully understanding or verifying their purchases.

For example, Pacific Gas and Electric Company's (PG&E's) PCL[9] from California's PSD program provides a clear illustration of how PSD functions at the product-specific level. PG&E publishes separate disclosures for each of its retail products distinct from its standard service. Each label shows the fuel mix and associated emissions intensity for that product, based on the contracts and certificates that support its supply portfolio.

Best Practices

- PSD should always be product-specific, not reported as grid averages or utility-wide mixes
- PSD must present the fuel mix and emissions profile at the product level so that claims are credible, comparable, and aligned with the actual attributes purchased by customers

9 While this real-world PCL example demonstrates the product-specific nature of PSD, it does not reflect all the best practices from this guidance. More regulatory PCL examples can be seen on the California Energy Commission's Power Content Program: https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label

Bundled and Unbundled EACs

EACs are the recognized instruments that define and verify the environmental and generation attributes of electricity. In the United States, RECs are the most common type of EAC, representing the renewable attributes of one megawatt-hour (MWh) of generation. EACs provide the contractual mechanism that enables credible accounting, marketing, and claims of renewable electricity use.[10]

For PSD, the accurate accounting of both bundled and unbundled EAC procurements by the electricity supplier is essential to ensure that all transactions are included, that customers see what they are entitled to claim, and that renewable electricity is not double counted.

- **Bundled EAC** procurement refers to purchases of both electricity and its associated EACs together in a single transaction, typically from a single entity and often from a single generator

- **Unbundled EAC** procurement refers to purchases of EACs separately from electricity supply or in a separate transaction by an electricity supplier and later paired by the supplier with owned or contracted energy[11] [12]

Both forms of procurement are valid for delivering renewable attributes to retail sales and customers. Renewable electricity claims must be based on exclusive ownership and retirement of RECs or equivalent EACs, regardless of whether they are procured bundled or unbundled by the electricity supplier. Comprehensive PSD requires that all attribute transactions by an electricity supplier, whether bundled or unbundled, be represented and disclosed.

Procured unbundled EACs are applied to retail electricity sales and redefine the characteristics (and emissions) of the delivered electricity. The generation attributes that would otherwise have been reported for those sales are reassigned to the "null power" associated with the generator of the EAC. These null power emissions are allocated to customers receiving the residual mix, provided that tracking systems or methodologies account for such transactions.[13] "Residual mix" is a term used in energy and GHG emissions accounting to describe the unallocated or unclaimed electricity generation and associated emissions in a certain area over certain period of time.[14] Customers receiving the residual mix include purchasers of null power and unspecified power.

REC vintage refers to the time period in which the underlying renewable generation occurred. PSD relies on appropriate vintaging to ensure that the renewable attributes retired on behalf of retail customers correspond to recent generation and accurately characterize the electricity sold during the reporting year. Programs differ in how they define acceptable vintages. Green-e® Energy, for example, allows a 21-month vintage window, reflecting the reality that REC issuance, transfers, and contracting often do not align perfectly with the calendar year in which retail load occurs. A bounded level of flexibility is therefore necessary to accommodate certificate availability and normal market timing.

10 Center for Resource Solutions. (2023, April 30). *The Legal Basis for Renewable Energy Certificates* (v2.0). Center for Resource Solutions. Available at: https://resource-solutions.org/document/the-legal-basis-for-renewable-energy-certificates/.

11 While this guidance does not prescribe geographic sourcing limitations or other procurement practices, stakeholders have emphasized that unbundled REC procurement by electricity suppliers for their bundled sales through green pricing programs, green tariffs, or other electricity products should, where feasible, maintain regional alignment between generation and consumption. Sourcing unbundled RECs from within the same grid region for these products and sales of electricity and RECs together to customers helps ensure that renewable generation and residual mix adjustments occur within coherent accounting boundaries. This recommendation reflects stakeholder discussions rather than a binding requirement. It also aligns with best practices for marketing utility retail electricity products.

12 Certain voluntary and compliance programs have chosen to restrict the application of unbundled EACs purchases to only generation that is "as clean or cleaner" than the grid average. While this is not needed for accurate accounting, it can address "fairness" and accountability concerns related to the shifting of emissions to other customers and the procurement of specified fossil power and subsequent use of unbundled RECs.

13 In the absence of nationwide all-generation tracking, regional residual mixes may not fully capture cross-regional attribute reallocations. As a result, the emissions factor (EF) of null power in the generating region could be underestimated. For more information, see CRS's Clean Energy Accounting Project guidance *Calculating Residual Mix*. Retrieved from https://resource-solutions.org/document/030624/.

14 ibid

Accounting for banked RECs requires recognizing that compliance and voluntary programs may operate on different timeframes. Voluntary standards and disclosure programs commonly allow limited REC vintage windows—such as the 21-month window used in the Green-e® Energy program—to reflect market realities, including the timing of generation, certificate issuance, contracting, and retirement, which do not always align cleanly with a single calendar year. State RPS programs may further diverge from annual alignment due to multi-year compliance periods and banking provisions, meaning that the renewable attributes retired for compliance in any given year may not correspond exactly to generation from that same year. For PSD, the best practice for renewable electricity claims is that RECs establish zero-emissions claims in the reporting year in which they are retired, regardless of the year of generation, within an approved vintage window. Over the full RPS compliance period, annual product content labels will therefore average out to accurately reflect policy-driven renewable supply, even if individual disclosure years reflect the use of banked or prior-vintage RECs.

Energy storage presents additional considerations for power source disclosure because storage does not generate electricity, but instead stores and later discharges electricity that was produced by other resources. State programs and certificate tracking systems vary in how storage is treated, including whether and under what conditions electricity associated with storage may be eligible for renewable or clean energy recognition. In some cases, attributes may be associated with electricity discharged from storage only if the charging electricity is sourced from eligible generation and tracked in a manner that prevents double counting. Because many storage technologies are net consumers of electricity over time, improper accounting can risk overstating renewable content or duplicating energy attribute claims. As an interim best practice for PSD, disclosures should reflect generation attributes only where they are supported by certificate issuance and exclusive retirement under applicable tracking system and program rules, and should not assign new or additional attributes to electricity solely as a result of storage operation. Until storage-related accounting approaches are more fully harmonized across regulatory programs and tracking systems, PSD programs should apply conservative, transparent treatment of storage and clearly document how storage-related electricity is reflected in resource mix and emissions disclosures.

For PSD, the key principle is that RECs substantiate renewable electricity claims and support zero- or low-emissions claims at the operational stage of electricity generation, reflecting how emissions are defined and reported for electricity consumption claims in PSD and related GHG accounting standards, and not implying that renewable resources are emissions-free across their full lifecycle.

Best Practices

- Include all EAC transactions and retirements—both bundled and unbundled—on behalf of retail electricity sales in PSD
- Accurately reflect unbundled EAC procurements within the disclosed resource mix when they are applied to retail load
- Ensure that null power is reported and properly allocated to other customers via regional residual mixes or use of fossil-only emissions factors where residual data is unavailable
- Maintain transparency regarding REC sourcing geography and the treatment of null power and ensure that there is exclusive ownership over imported RECs to prevent double counting
- Apply EACs to load in year in which they were retired

Tracking Systems

EAC tracking systems are critical infrastructure for credible and transparent PSD. They issue, transfer, and retire EACs, creating auditable records that substantiate transactions and claims about specified electricity use. By documenting exclusive ownership and use of generation attributes, tracking systems reduce double counting and build confidence that renewable or clean energy reported in a disclosure has been uniquely assigned. They also ensure that PSD reflects the contractual rights associated with environmental attributes, supporting alignment with GHG accounting standards and voluntary frameworks.

The scope and functionality of tracking systems differ by region:

- **All-generation tracking systems** (e.g., PJM Generation Attribute Tracking System [PJM-GATS], New England Power Pool Generation Information System [NEPOOL-GIS], New York Generation Attribute Tracking System [NYGATS]) provide the most comprehensive and reliable information and should be used as the basis for PSD in regions and for resource types where they are available. Certificate issuance, ownership, and retirement records in these systems can be used to disclose every generation type and to support comprehensive residual mix calculations

- **Renewable-only tracking systems** (e.g., Western Renewable Energy Generation Information System [WREGIS], CleanCounts [formerly the Midwest Renewable Energy Tracking System or M-RETS], North American Renewables Registry [NAR]) should be used to substantiate renewable claims for the resources tracked, and to ensure that RPS compliance content is accurately reflected, in PSD

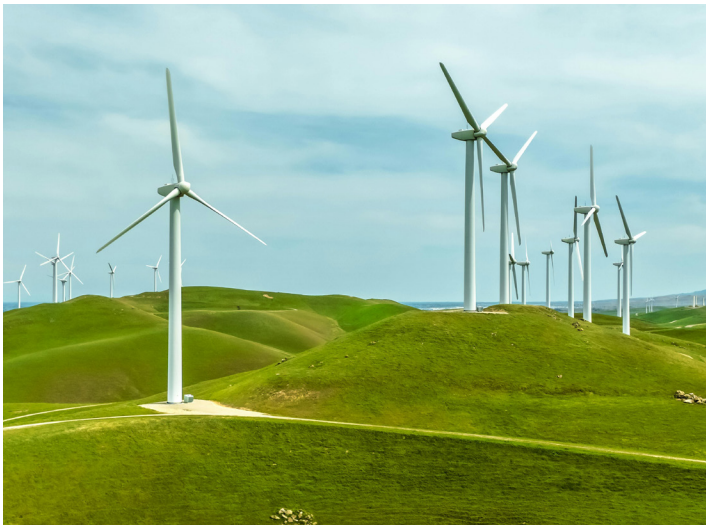
All-generation tracking also enables calculation of residual mixes,[15] which are necessary to allocate unclaimed generation to unspecified purchases, unfulfilled load (load not covered with specified contracts or attributes), and null power (generation from which the attributes have been stripped and sold). Without residual mixes, disclosures risk overstating renewable content by relying on averages that may double count generation already transacted and reported elsewhere.

Best Practices

- Use all-generation EAC tracking systems (where available) as the basis for PSD, covering all resource types

- Require renewable energy claims to be substantiated through REC issuance and exclusive retirement in a tracking system

- Use tracking system residual mixes and emissions factors (where available) or use tracking system and other transaction data to calculate residual mixes, and apply those residual mixes to unfulfilled load and null power



15 Center for Resource Solutions. (2024, March 6). *Guidance For Calculating Residual Mix* (31 pages). Retrieved from https://resource-solutions.org/document/030624/

Integration with State Load-Based Policies

PSD should faithfully reflect the effects of state load-based policies on retail electricity. Disclosures must align with what customers are legally entitled to receive and claim under programs such as RPS, CES, and load-based GHG regulations. When these policies are not represented accurately—such as when unbundled RECs used for compliance with these programs are excluded from PSD, as in California—the result is a mismatch between what customers receive and what appears on the disclosure (i.e., the disclosure is not accurate). This creates confusion and undermines the integrity of both compliance programs and customer-facing disclosure.

The foundation for both compliance and voluntary renewable claims is the exclusive retirement of RECs.[16] Using unique certificates for every MWh of renewable electricity prevents double counting across compliance programs and voluntary markets. Alternative compliance payments (ACPs) or multipliers cannot substitute for attributes; only EAC issuance and retirement can substantiate claims. International frameworks reinforce this principle: for example, the RE100 initiative requires that all renewable claims be supported by the issuance, tracking, and permanent retirement of certificates.[17]

RPS programs commonly include banking provisions and multi-year compliance periods, which means that the renewable attributes retired for compliance in any individual year may not match the renewable generation that occurred during that year. PSD, however, is an annual disclosure that reflects the REC retirements applied to retail load for that specific reporting year. The best practice for renewable electricity claims is that RECs create zero-emissions claims in the year in which they are retired, not necessarily the year in which they were generated. Over the full multi-year RPS compliance period, annual PSD disclosures will "average out" to accurately reflect RPS-driven renewable supply, even if any single year contains banked or older-vintage RPS RECs.

To ensure accuracy, all renewable and clean energy used to meet retail sales under RPS, CES, or other load-based programs should be included in PSD, based on certificate issuance and retirement data from tracking systems. Residual mixes should be used for any unspecified or null power so that totals are complete and do not double count. Where renewable content represents voluntary generation purchased in excess of policy requirements, this should be clearly indicated, so that both compliance-driven and voluntary supply are transparent.[18]

Best Practices

- Align PSD directly with state load-based policies so that disclosure fully reflects RPS, CES, and GHG compliance programs
- Use tracking-system retirements as the basis for disclosure and incorporate unbundled REC procurements for retail sales into the resource mix
- Ensure that claims are tied to actual EAC retirements, not alternative compliance payments or compliance multipliers
- Where state rules block full representation, disclose the limitation and recommend updates to bring PSD into alignment

16 U.S. Environmental Protection Agency. *Guide to Action: Renewable Portfolio Standards*. 2015. Accessed July 2025. https://www.epa.gov/sites/default/files/2015-08/documents/guide_action_chapter5.pdf

17 *RE100. RE100 Technical Criteria*. The Climate Group & CDP, updated March 2023. Accessed July 2025. https://www.there100.org/technical-guidance

18 In cases where a single megawatt-hour (MWh) may be used for compliance across multiple load-based programs (i.e., the programs are complementary rather than incremental), the PSD program should ensure that generation is not double counted when compliance information is incorporated into PSD.

Unspecified Power, Null Power, and Unfulfilled Load

Specified power is electricity with generation source and attribute information that is verifiable through auditable documentation—such as EAC issuance and retirement, contractual arrangements, or direct ownership of generation. By contrast, unspecified power is electricity acquired through wholesale markets or other arrangements without auditable source or attribute documentation, and null power is electricity from which attributes have been stripped and sold. In both unspecified and null power cases, no renewable or specified source claim is available to the customer.[19]

For PSD, both unspecified and null power may be presented together as "unspecified" in the resource mix on the PCL. The key is how these supplies are treated in GHG calculations: both should receive a residual mix emissions factor that is matched to the reporting period and geography and that explicitly reflects observed EAC transactions and null power.[20] Where a suitable residual mix is not available, electricity suppliers should apply fossil-only emissions factors to avoid understating emissions and to maintain comparability with other products and jurisdictions.

When wholesale market purchases are characterized via market allocation frameworks, such as CAISO's Accounting and Reporting framework,[21] those frameworks must fully incorporate EAC issuances, transfers, and retirements, as well as null power, to avoid inflating renewable shares or double counting.[22] Residual mixes and any allocation methods should be transparent, published with the factors used, and auditable.

Best Practices

- Present unspecified and null power together as "unspecified" on the disclosure and assign both the residual mix (period- and region-matched, reflecting EAC transactions and null power)
- Apply residual-mix allocation to unspecified purchases, null power, and unfulfilled load so that all supply can be categorized by resource type; reconcile totals so specified + residual = retail sales
- Publish methodology and factors (residual mixes, allocation rules) and maintain an audit trail tied to tracking system data
- Where residual mixes are unavailable, default to fossil-only emissions factors

19 Federal Trade Commission. (2024). *Guides For The Use Of Environmental Marketing Claims* (16 C.F.R. § 260.15(d)). U.S. Government Publishing Office. https://www.ecfr.gov/current/title-16/chapter-I/subchapter-B/part-260/section-260.15

20 Center for Resource Solutions. (2024, March 6). *Guidance for Calculating Residual Mix* (v1.0). Center for Resource Solutions. https://resource-solutions.org/wp-content/uploads/2024/03/030624.pdf

21 California Independent System Operator. (2025, October 21). *Making Energy Emissions More Transparent: CAISO's Accounting and Reporting Approach.* Retrieved October 23, 2025, from https://www.caiso.com/about/news/energy-matters-blog/making-energy-emissions-more-transparent-caisos-accounting-and-reporting-approach

22 Center for Resource Solutions. (2024, November 21). *Background Report: GHG Allocation and RECs in Western Markets.* https://resource-solutions.org/document/112124/

Transmission and Distribution Losses

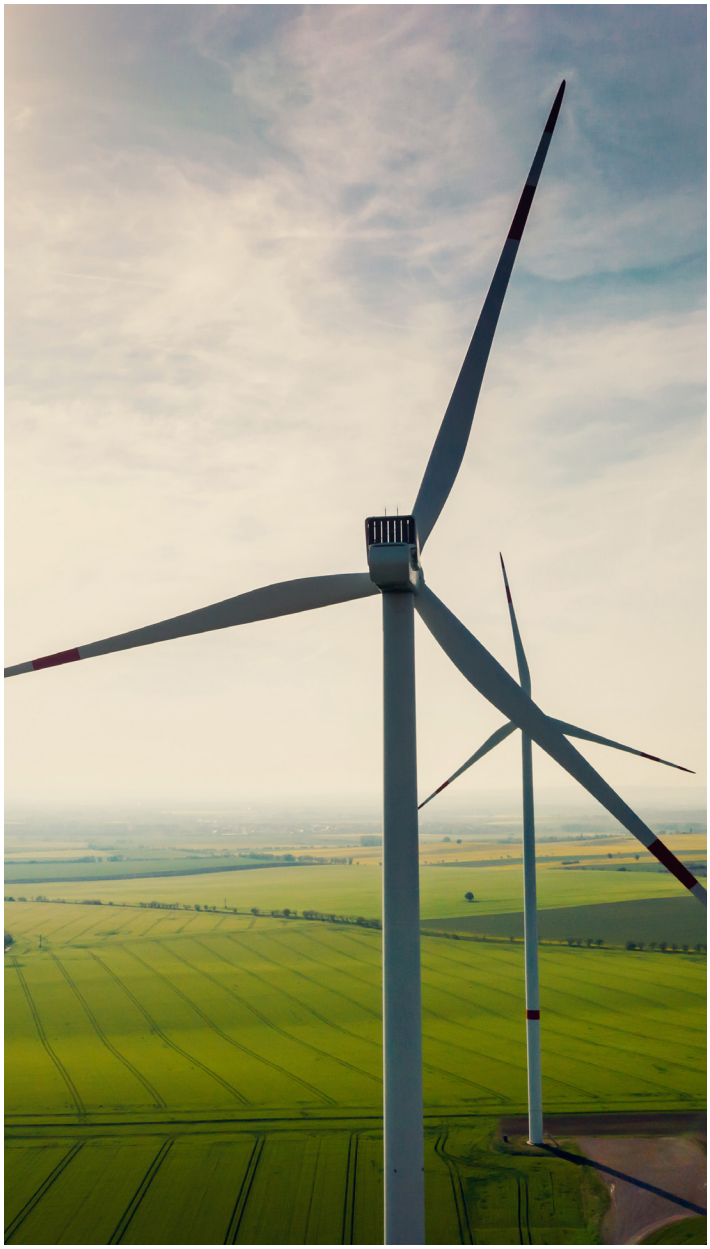
Transmission and distribution (T&D) losses occur when electricity is lost as it travels from generation facilities through transmission and distribution systems to end-use customers. These losses are calculated at the system or utility level, and reporting practices vary across jurisdictions.

According to the GHG Protocol, T&D losses linked to purchased electricity are considered supplemental Scope 3 emissions.[23] They represent delivery inefficiencies rather than attributes of purchased electricity itself. While regulators may wish to disclose T&D loss data for system-level transparency, including them directly in product-specific PSDs risks confusing customers and distorting product-level claims. States or programs seeking additional transparency can provide T&D losses as supplemental information, as California does by reporting them as a separate line item.

In the context of PSD, it is important to emphasize that all attributes are nevertheless accounted for, even when some generated energy is lost in transmission. Attributes tied to generation sold directly to customers—whether through RPS compliance or voluntary sales—are allocated to customers on a one-to-one basis. Generation of electricity that is lost in T&D is included in the residual mix of generation not transacted on a specified basis. In GHG calculations, these losses may appear indirectly as part of the "unspecified" category in the resource mix.

Best Practices

- Treat T&D losses as optional supplemental information, not as part of product-specific attributes or emissions profiles
- Reflect T&D losses through residual mix calculations so that all attributes remain accounted for in PSD and GHG reporting



23 World Resources Institute; World Business Council for Sustainable Development. *GHG Protocol Scope 2 Guidance: An Amendment to the GHG Protocol Corporate Standard*. January 2015. https://ghgprotocol.org/scope_2_guidance

Behind-the-Meter Generation

Energy from behind-the-meter (BTM) generation (e.g., rooftop solar) primarily serves on-site load, but its treatment in PSD depends on how its attributes are allocated. PSD is only for retail sales by the reporting electricity supplier (purchased electricity by the consumer); it reflects only the attributes delivered through a supplier's retail product. For that reason, BTM generation may or may not appear in PSD depending on whether there is net metering and whether the attributes have been retained or sold off.

If the customer retains the attributes (e.g., keeps the RECs from their rooftop solar), the BTM generation and consumption may fall outside of utility-delivered supply and does not enter the utility's PSD. If the attributes are sold, the host customer can no longer make renewable claims, and the portion of load served by the BTM system becomes purchased electricity and null power, assigned the residual mix.[24] If the EACs/attributes are sold independently by the onsite customer, the null power consumption may still fall outside of the electricity supplier's PSD.

When BTM generation is grid-connected and the electricity supplier purchases both the energy and its attributes, it can be included in PSD as part of the electricity supplier's product as either voluntary renewable energy generation for a voluntary product or as a part of RPS renewable energy delivered to all customers. In that case, the supplier reports it in the product mix with the associated attributes. If the supplier acquires the energy without the attributes, the generation is treated as null and included in the unspecified category. BTM generation must be reflected in PSD in a way that follows ownership of attributes: either allocated to the retail product if the supplier owns the attributes or excluded and treated as separate from the supplier's mix if the attributes are retained by the host.

Best Practices

- Include BTM generation in PSD as specified power only if the supplier purchases both the energy and its attributes, with exclusive retirement documented
- If BTM generation is consumed by the host and the attributes are retained by the host, exclude that generation from the supplier's retail load and PSD
- Treat BTM generation sold without attributes as null power, assigning the residual mix

24 Federal Trade Commission. (2024). *Guides For the Use of Environmental Marketing Claims* (16 C.F.R. § 260.15(d)). U.S. Government Publishing Office. https://www.ecfr.gov/current/title-16/chapter-I/subchapter-B/part-260/section-260.15

Resource Types

Accurate and consistent categorization of generation resources is essential for comparability across PSD programs and for ensuring that both regulators and customers can interpret disclosure data consistently. Today, resource classification varies widely by jurisdiction. For example, California[25] distinguishes between "Eligible Hydroelectric" (small hydro qualifying under the state's RPS) and "Large Hydroelectric," while New York[26] aggregates both into a single "Hydroelectric" category. Other states, such as Tennessee, have introduced categories like "clean energy" or "green energy" that combine renewables with nuclear power or even natural gas.[27] Such differences undermine cross-jurisdictional comparability, complicate emissions accounting, and create confusion for customers—especially those operating across multiple states.

While PSD should reflect the actual resources used to deliver supply—including those used for RPS compliance—this does not mean that resource category names must exactly match RPS definitions, particularly when those categories lack transparency. Instead, PSD should rely on actual fuel types with clear, uniform definitions that match well-established voluntary standards.

Recommended Categories:

- Wind
- Solar
- Hydroelectric
- Geothermal
- Biomass
- Natural Gas
- Coal
- Nuclear
- Unspecified

This level of specificity allows disclosures to be both accurate and comparable, while still enabling regional flexibility for reporting. It also ensures that terms like "renewable," "clean," or "green" are not used as catch-all categories that obscure the actual fuel types delivered. However, PSD programs can choose to be more specific, including identifying whether a hydropower project is LIHI certified[28] as a low-impact project, different types of biomass, on-shore or off-shore wind, and different types of solar.

Best Practices

- Use consistent, fuel-specific categories across jurisdictions to enable comparability and benchmarking
- Provide sufficient granularity to accurately represent delivered resources, avoiding broad or ambiguous categories
- Reflect RPS deliveries in PSD but avoid adopting opaque RPS category names when they obscure underlying resource types

25 California Energy Commission, Power Source Disclosure Program, Annual Power Content Label: CEC Power Content Label (Available at: https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label/annual-power-4)

26 New York Generation Attribute Tracking System (NYGATS) Environmental Disclosure Label: NYGATS Public Report (Available at: https://nygats.ny.gov/ng/Report/getdto_view_Report_PublicEDPLabel)

27 Tennessee General Assembly. House Bill 1143: Clean and Green Energy Act. Enacted May 2025.

28 The Low Impact Hydropower Institute (LIHI) is a non-profit organization based in the United States with a mission to recognize and support hydropower projects that prioritize environmental, recreational, historical, and cultural resource protection. LIHI offers the only science-based Low Impact Certification program in the United States for hydropower projects, regardless of their size or regulatory status. Learn more about LIHI certified hydropower here: https://lowimpacthydro.org/certification-program/

PSD Granularity and Frequency

Consistency in both disclosure frequency and accounting granularity is essential for comparability across products, utilities, and jurisdictions. These concepts are related but distinct:

- Frequency refers to how often disclosures are published and provided to customers (e.g., annually, quarterly)
- Granularity refers to the time interval used to match generation and attributes to load in the accounting itself (e.g., annual, quarterly, monthly, hourly)

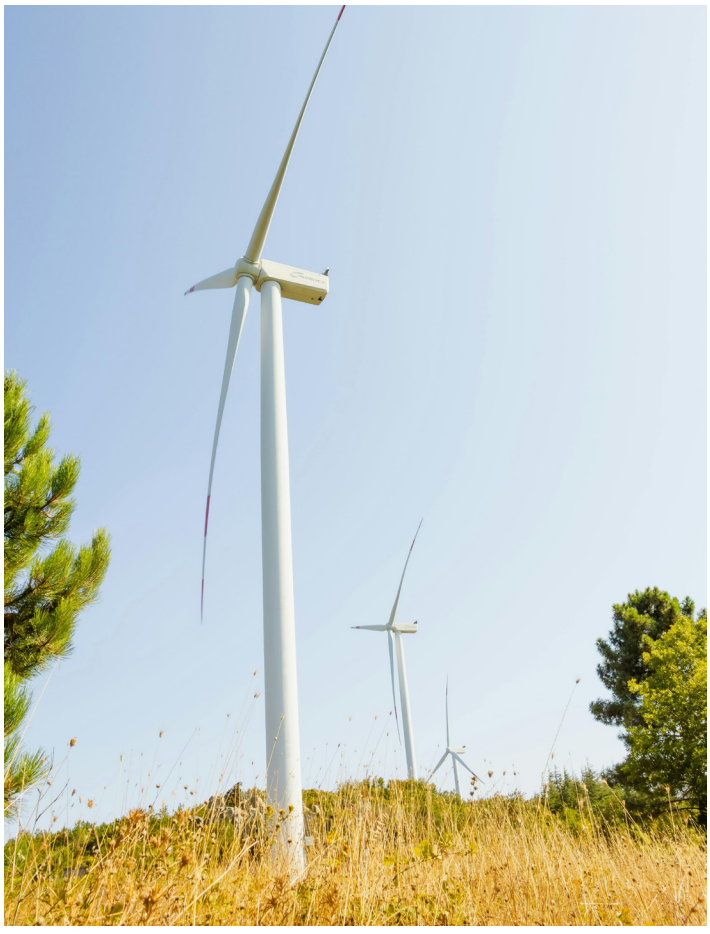
If disclosures are too infrequent, customers cannot reliably interpret the environmental attributes of their purchases, and regulators cannot effectively oversee performance. If the underlying accounting is not sufficiently granular, the reported results may obscure important variation and differences in how generation and attributes align with consumption.

Annual disclosure has emerged as the prevailing reporting frequency across both compliance programs and voluntary certification systems. For example, California requires suppliers to submit and publish disclosures on an annual basis, and the Green-e® Energy program similarly mandates that certified products disclose on a yearly cycle. Other state programs, including those in the Northeast and Mid-Atlantic, also rely on annual filings. This cadence aligns with the availability of data from certificate tracking systems, regulatory compliance filings, and emissions inventories, which are themselves reported on an annual basis. Establishing annual disclosure as the baseline ensures that PSD is consistent with broader greenhouse gas reporting frameworks, reduces administrative burden, and meets customer expectations for regular, comparable information about their electricity supply.

For the granularity of allocations, this guidance recommends at least annual matching of generation and attributes to load as the minimum standard for credible PSD. Annual matching ensures that all procurement, certificate retirements, and residual mix factors are reconciled over a complete reporting year, preventing gaps or double counting across products. This approach provides an auditable, system-wide snapshot of supply that captures the full interaction between compliance-driven and voluntary retirements. More granular approaches—such as monthly or hourly matching—can provide additional insight into the temporal alignment between generation and consumption and may be valuable in emerging contexts, such as hourly REC tracking, Scope 2 emissions reporting, or hourly clean energy commitments.

Best Practices

- Require PSD disclosure at least annually at the product level
- Use annual matching of generation and attributes to load as the minimum granularity for credible PSD



Part II: Application Across Market and Tracking Scenarios

The principles outlined in Part I establish a framework for credible and consistent power source disclosure and are broadly applicable across the United States. These concepts are designed to be widely leveraged by regulators, suppliers, and market participants, providing a framework that can enhance transparency and comparability nationwide. Applying these practices is critical to ensuring that disclosure serves both customers and policy goals effectively. However, given differences in electricity market structures, regulatory contexts, and the scope of attribute tracking systems, certain elements may need to be tailored to specific jurisdictions. To provide practical guidance, this section describes common scenarios and illustrates how the best practices can be adapted in each. These scenarios are not exhaustive, but they capture broad conditions affecting PSD that regulators and suppliers are likely to encounter.

Scenario 1: States with Comprehensive All-Generation Tracking

Examples: PJM-GATS, NEPOOL-GIS, NYGATS.

Data Landscape

In all-generation tracking systems, every MWh of generation receives a certificate that reflects its fuel type and source attributes. Registries record issuance, transfers, retirements, facility-level details, resource type, and geography. At the close of each reporting, trading, or control period, the registry aggregates unclaimed certificates to form a residual mix, which can then be applied to any load not directly matched with retired certificates in PSD programs. This ensures that every unit of retail sales is covered by attributes from within the system, making the process auditable and regionally consistent.

However, specified transactions involving generation that is not participating directly and specifically registered with an account in the tracking system ("non-registered" generation)—most commonly fossil resources—require additional treatment. Data for this generation is often provided to the tracking systems by the local market operator, and associated certificates are issued into the system administrator's account and automatically included in the system residual mix. This may be because there is no market demand for their EACs. While the best practice is to use certificates as the foundation for PSD, when these non-registered generators sell electricity under bilateral or market-settled contracts, those specified transactions must be recognized in PSD to ensure accuracy and avoid overstating unspecified or residual power.

PSD programs should incorporate verified market transaction data for these specified transactions to properly credit them to the contracting utility or supplier on the basis of the electricity contract. Once those transactions are incorporated as specified, the associated

generation should be removed from the tracking system's residual mix, ensuring that the same generation is not double counted or left classified as unspecified.

For example, a coal generator that is not directly registered in the all-generation tracking system may still have a contract to deliver power to a specific utility. In such cases, PSD rules should assign that generator's attributes to the contracting utility and back those MWh out of the residual mix of the tracking system.

Implications for Disclosure

Suppliers and regulators can ground disclosure entirely in certificate data (with the exception of purchases from non-registered fossil generators described above), producing product-level results that reconcile all retail sales with certificate retirements. By ensuring that every MWh is issued, transferred, and retired within a single certificate registry, this all-generation tracking model provides a fully verified system that is consistent across the region. Residual mixes can then credibly allocate any remaining supply, while emissions intensities align directly with the attributes retired for each product, delivering highly accurate and comparable labels. This is the most advanced and reliable form of PSD and PSD programs should pursue full certificate-based tracking as the standard for transparency, integrity, and comparability.

Risks/Limitations

All-generation registries supply verified data, but they do not automatically produce disclosure results. PSD programs must still apply consistent rules to ensure comparability—for example, by standardizing resource categories across state programs and addressing certificate issuance for imports.

Treatment of imports and exports varies by registry. In NYGATS, imports from a compatible tracking system can be issued unit-specific certificates "if the energy being imported is coming from an area with a Compatible Certificate Tracking System"[29] —otherwise the imported load is covered with the residual mix of the exporting region. NYGATS also facilitates the import of unbundled certificates into its tracking system, but such unbundled certificates are not eligible for use in the state's Environmental Disclosure Program Labels.[30] PSD programs should set clear policies that exclude exported certificates since their attributes are no longer available to retail customers.

29 New York State Energy Research and Development Authority. (2020). *NYGATS Operating Rules.* New York Generation Attribute Tracking System. https://www.nyserda.ny.gov/-/media/Project/Nyserda/files/Programs/NYGATS/Operating-Rules.pdf

30 ibid

Scenario 2: States with Renewable-Only Tracking

Examples: WREGIS (mandated in California), CleanCounts (formerly M-RETS), and NAR (voluntary registry serving the Southeast and Midwest).

Data Landscape

All states can access a renewable tracking system, but its use for PSD varies. However, these systems provide accurate, verified attribute (certificate) transaction data for the renewable generation that is tracked. That data should be used as the basis of PSD for that generation. Untracked non-renewable data should come from contracts, utility reports, or regulatory filings. Complete residual mixes are not calculated by renewable-only tracking systems, and are therefore often unavailable in these regions. In this case, they must be manually calculated and often result in reliance on fossil-only generation mixes.[31]

Implications for Disclosure

In states with renewable-only tracking, RECs must form the basis for the renewable portion of PSD. Where RECs are issued, they must be used to report both resource types and emissions, ensuring that renewable supply is directly and exclusively substantiated through auditable certificate retirements. This anchors disclosure in a consistent, verified system and eliminates ambiguity about renewable claims.

For specified claims of non-renewable resources not covered by tracking systems, contractual documentation—such as power purchase agreements or utility contracts—may be used to demonstrate delivery and ownership. Any remaining unspecified or null supply, where neither certificates nor contracts are available, must be assigned residual mix emissions factors, or fossil-only mixes where residual mixes are unavailable.

Risks/Limitations

Because non-renewable resources are not tracked, reconciliation of total supply is weaker than in all-generation systems. If residual or fossil-only mixes are not applied consistently, disclosures may exaggerate renewable content and understate emissions.[32]

31 Instructions for manually calculating residual mixes can be found at: Center for Resource Solutions. (2024, March 6). *Guidance for Calculating Residual Mix*. Retrieved from https://resource-solutions.org/document/030624/

32 Potential sources of residual mixes can be found at: Center for Resource Solutions. (2024, March 6). Guidance for Calculating Residual Mix. Retrieved from https://resource-solutions.org/document/030624/

Scenario 3: States with Load-Based GHG Policies

Examples: Washington (Clean Energy Transformation Act, PSD), California (imported electricity under Cap-and-Trade, PSD), Oregon (HB 2021).

Data Landscape

In some jurisdictions, utilities are subject to load-based GHG policies, which regulate the emissions associated with electricity consumed in the state or sold to customers rather than emissions at the point of generation. Both Washington and California, for example, operate PSD programs alongside GHG policies. These include load-based frameworks as well as source-based programs with load-based elements (e.g., California's treatment of imported electricity under the cap-and-trade program).

PSD data and load-based GHG compliance data are interconnected but may not be identical. GHG compliance programs may measure emissions across different entities, time periods, or levels of granularity than PSD requires. For instance, cap-and-trade reporting may aggregate GHG outcomes for state-level imports, whereas PSD needs to reflect product- or resource-specific attributes at the retail level. They may also use different tracking and accounting mechanisms for allocation emissions. The key principle is that PSD must align with both load-based GHG policies and any load-based elements within source-based programs so that customers see results consistent with what regulators enforce.

It is also important to note that Scenario 3 is not mutually exclusive from Scenarios 1 and 2. States like Washington and Oregon face conditions of both renewable-only or partial tracking (Scenario 2) and load-based GHG regulation (Scenario 3). Effective PSD programs must reconcile these overlapping frameworks to ensure consistency across compliance, voluntary markets, and customer-facing disclosure.

Implications for Disclosure

To maintain integrity, PSD must align with load-based compliance outcomes. Where attributes or emissions are accounted for in load-based compliance, they must be reflected in PSD, so customers see the same clean energy and emissions results that regulators enforce. At the same time, compliance retirements and voluntary retirements should be identified separately for transparency and reconciled against total supply. This ensures no double counting and allows customers to clearly distinguish between the baseline provided by policy and any voluntary clean energy products layered on top.

Risks/Limitations

The primary risk is a disconnect between regulatory compliance and customer-facing disclosure. Load-based programs guarantee certain clean energy or emissions outcomes, but without clear PSD rules, customers may not see those results reflected in disclosures. This can create ambiguity about what customers are entitled to under policy versus what they purchase voluntarily. In states with both PSD and load-based GHG programs (e.g., California, Oregon, Washington), the challenge is to ensure consistency across frameworks—recognizing that Scenario 3 can and often does overlap with Scenarios 1 and 2.

Another risk is that the differences between load-based GHG programs and other renewable energy and PSD programs (as described above) are not properly accounted for or make incorporating those program outcomes into PSD difficult or impossible. For example, in Oregon, under HB 2021, an emissions-based compliance program for utilities, RECs are not required to demonstrate delivery of zero-emissions power for renewable sources to utility load. This creates a risk of double counting and makes it difficult to properly account for renewable energy in PSD where the RECs associated with HB 2021 generation have been sold off or there is a discrepancy between HB 2021 and the state RPS.

Conclusion

Power source disclosure provides critical transparency and consumer protection in retail electricity markets. Ultimately, this guidance affirms a simple but powerful commitment: every customer has the right to know, with confidence and clarity, the sources of the electricity they've purchased and the associated emissions. Without clear and consistent rules, customers risk being misinformed about the power they are buying and the choices they make as consumers or—in the case of corporate buyers—being unable to accurately track, verify, and meet their climate and Scope 2 emissions goals. Regulators also lack reliable data to evaluate policies, while suppliers face uneven expectations that increase complexity, raise costs, and can unintentionally create opportunities for inconsistency. This guidance addresses those challenges by establishing a framework for disclosure that can be applied nationwide.

Part I established the principles of credible disclosure in greater depth. Disclosure must be product-level, providing customers with information specific to the electricity products they purchase rather than aggregate or utility-wide averages. It must also align with load-based policies so that the results customers see match the outcomes that regulators enforce. Where certificates exist, such as EACs in all-generation tracking systems, they must serve as the definitive basis for reporting both resource types and emissions. Finally, for any unspecified or null supply, disclosure must rely on residual mixes—or fossil-only mix defaults where residual mixes are unavailable—to transparently cover unclaimed electricity and prevent double counting. Part II demonstrated how these principles apply in practice across the major U.S. scenarios, from all-generation tracking systems to renewable-only tracking systems, and jurisdictions with load-based GHG policies. Appendix A provides a technical methodology that regulators and suppliers can use directly, ensuring that disclosures are replicable, auditable, and comparable.

Together, these components represent best practices for disclosure and a practical pathway for implementation. Regulators can adopt these practices to harmonize requirements across states and programs, suppliers can apply them to strengthen the credibility of their products, and customers benefit from disclosures that are transparent, accurate, and comparable.

As markets and programs evolve—introducing more granular reporting and compliance, incorporating new resource types, and raising ambition—the principles and methods outlined here will be essential. Only by applying them can disclosure frameworks remain credible, comparable, and trustworthy, giving customers confidence, enabling effective policymaking, and ensuring the integrity of clean energy claims in a rapidly changing landscape.

Appendix A: Calculation Methodology for Power Source Disclosure

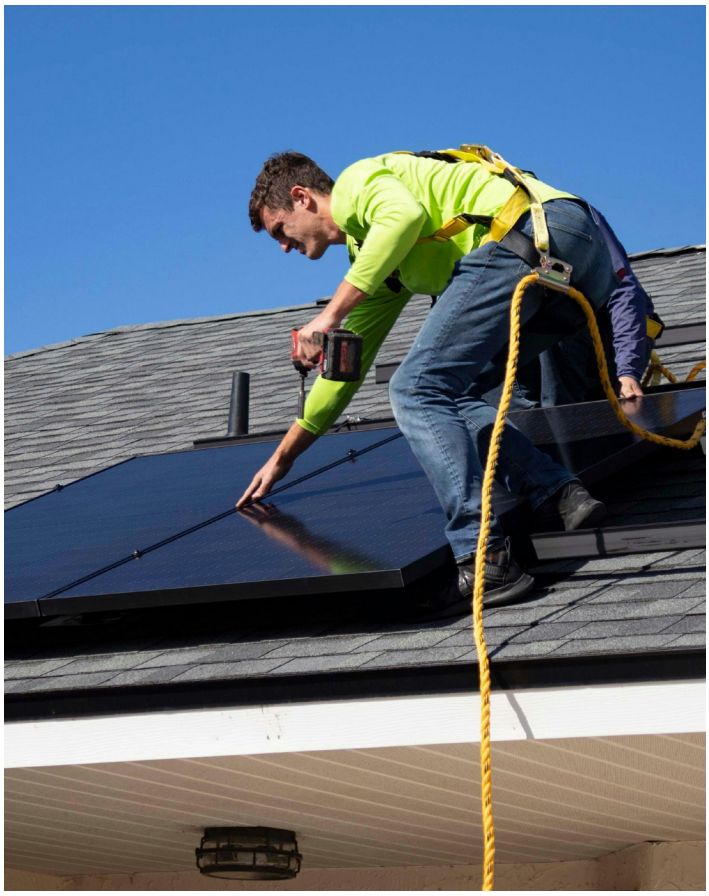
This appendix provides a standardized method for calculating product-specific resource mixes and emissions intensities in line with the principles set out in Part I and the scenarios described in Part II. It is intended as a technical reference for program staff, utilities, and suppliers who are responsible for preparing disclosures. The methodology is not meant to prescribe a single accounting system, but to ensure consistency, transparency, and comparability across jurisdictions and market contexts.

Key Outputs

- **Resource mix by product**—Percentage of retail load (MWh) by resource type, including specified resources, policy-driven renewables, voluntary renewables, and residual mix (unspecified and null power).
- **Emissions intensity by product**—Market-based emissions rate (tCO_2e/MWh), derived from specified and residual emission factors.

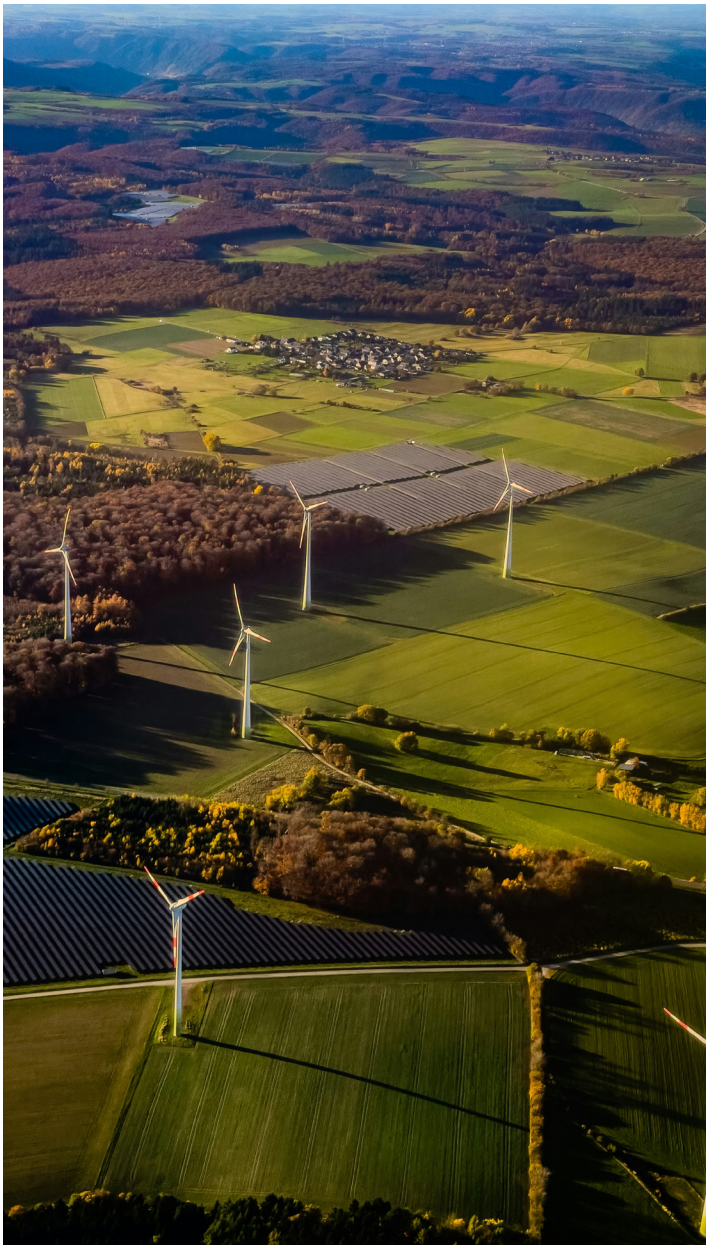
Workflow Overview

1. Determine total retail sales (in MWh) by product
2. Determine net specified bundled and unbundled attribute procurements by retail product/portfolio, including individual voluntary products and the standard service product; subtract resales and unallocated volumes from gross procurements.
3. Calculate unfulfilled sales/load for each product—unfulfilled load/sales is the amount that is not met with procured specified attributes.
4. Separate compliance vs. voluntary retirements—Ensure compliance-driven retirements (e.g., RPS, CES, GHG programs) are distinct from voluntary retirements.
5. Verify attributes—Confirm that all renewable claims are substantiated by exclusive REC/EAC retirements in a recognized tracking system.
6. Calculate product resource shares—(MWh by resource ÷ Total product MWh)×100
7. Allocate individual resources to broader resource type categories (e.g., renewable energy), if needed
8. Assign emissions factors—Use facility-specific for specified resources, and residual mix factors (or fossil-only defaults) for unspecified/null.
9. Calculate emissions intensity—(Total emissions ÷ Total product MWh)



Worked Example

Scenario & Goal. A supplier offers two products: a voluntary 100% renewable product ("GreenPower100") and a default Standard Service product that must meet a 20% RPS. The RPS applies to total retail load across both products. Additionally, the supplier sells 4,000 renewable attributes only (2,000 wind + 2,000 solar) unbundled, e.g., selling off the RECs. The associated 4,000 MWh become null and are assigned the Unspecified (residual mix EF) within the Standard Service product. The objective is to calculate product-level resource shares and emissions intensities consistent with best practices.



Inputs:

1) Total retail sales by product

- GreenPower100 = 20,000 MWh
- Standard Service = 80,000 MWh
- Total = 100,000 MWh

2) Specified energy procurements (must sum to total sales)

- Wind: 20,000 MWh
- Solar: 20,000 MWh
- Natural Gas: 50,000 MWh (EF = 0.45 tCO_2e/MWh)
- Unspecified (market): 10,000 MWh (assigned residual EF = 0.40 tCO_2e/MWh)
- Total: 100,000 MWh

3) RPS requirement (20% of total load)

- 20% × 100,000 = 20,000 MWh of renewable attributes retired (RPS)
- Allocated by product load share:
  - GreenPower100: 4,000 MWh (2,000 wind + 2,000 solar)
  - Standard Service: 16,000 MWh (8,000 wind + 8,000 solar)

4) Voluntary retirements (to reach 100% for GreenPower100)

- GreenPower100 retires 16,000 MWh additional voluntary attributes (8,000 wind + 8,000 solar)
- GreenPower100 total renewables retired = 20,000 MWh (100%)

5) REC sale (null power)

- Standard Service sells 4,000 MWh of renewable attributes (2,000 wind + 2,000 solar)
- These 4,000 MWh become null and are disclosed as Unspecified with the residual EF (0.40) in the Standard Service product

Allocations:

- GreenPower100 (20,000 MWh):
  - RPS renewables: 4,000 MWh (2,000 wind + 2,000 solar)
  - Voluntary renewables: 16,000 MWh (8,000 wind + 8,000 solar)
  - Total: 20,000 MWh renewable (100%)
- Standard Service (80,000 MWh):
  - RPS renewables: 16,000 MWh (8,000 wind + 8,000 solar)
  - Natural Gas: 50,000 MWh (EF = 0.45)
  - Unspecified (includes 10,000 market + 4,000 null from REC sale): 14,000 MWh (EF = 0.40)
  - Total: 80,000 MWh

Resource shares:

- GreenPower100: Renewable 100% (20% RPS + 80% voluntary); Gas 0%; Unspecified 0%
- Standard Service: Renewable 20.0%; Gas 62.5%; Unspecified 17.5%

Emissions intensities:

- GreenPower100: 0 tCO_2e ÷ 20,000 = 0.000 tCO_2e/MWh
- Standard Service: Gas = 50,000 × 0.45 = 22,500 tCO_2e; Unspecified (incl. null) = 14,000 × 0.40 = 5,600 tCO_2e

Total = 28,100 tCO_2e → 28,100 ÷ 80,000 = 0.351 tCO_2e/MWh (rounded)

PRODUCT	CATEGORY	RESOURCE	MWH	% SHARE	EF (TCO_2E/MWH)	EMISSIONS (TCO_2E)
GreenPower100	Policy (RPS)	Wind + Solar	4,000	20.0%	0.00	0
	Voluntary	Wind + Solar	16,000	80.0%	0.00	0
		Total	**20,000**	**100%**	—	**0**
Standard Service	Policy (RPS)	Wind + Solar	16,000	20.0%	0.00	0
	Specified fossil	Natural Gas	50,000	62.5%	0.45	22,500
	Unspecified (market + null from REC sale)	Market/Null	14,000	17.5%	0.40	5,600
		Total	**80,000**	**100%**	—	**28,100**

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