



## Energy Attribute Certificates

Consumers may choose to purchase energy from specific resources. These purchases are often made to reduce the emissions associated with the consumers energy use. Yet when energy, whether it is clean or conventional, is comingled and distributed through a shared network (such as electricity on a regional grid, gas in a pipeline distribution system), it is impossible to know the attributes of the energy generated and delivered to an individual consumer. Thus, a verification method is necessary to substantiate claims to specific energy sources, including renewables.<sup>1</sup> Energy attribute certificates are key to the substantiation and verification of energy generated, delivered, and consumed on a shared energy grid.

**An energy attribute certificate (EAC) is a contractual instrument that conveys information (attributes) about a unit of energy, including the resource used to create the energy and the emissions associated with its production and use.**

Other attributes conveyed by an EAC may include the location of the facility that generated the unit of energy, when that facility began operations, and when the unit of energy was produced.<sup>2</sup>

The World Resources Institute coined the term to be inclusive of tradable instruments used in the United States, Europe and elsewhere.<sup>3</sup> Various terms are used to refer to different types of EACs, including RECs (a type of EAC for renewable electricity), as well as certificates more generally. EACs can be used for multiple types of energy (e.g., gas, electrical, thermal), though they will be assumed in this paper to represent electricity generation unless otherwise noted.

The use of EACs is expanding globally, beyond the United States and Europe. Other countries may adopt their own names for energy attribute certificates, including guarantees of origin (GO), a name used in Europe, and International RECs (I-RECs), used in many other countries, but “EAC” is a widely accepted generic term that includes all types of contractual instruments that convey rights to energy attributes.<sup>4</sup>

Across applications, EACs are used to convey exclusive property rights to attributes of a unit of energy,<sup>5,6</sup> whether to substantiate compliance with government programs and policies, make voluntary claims of renewable energy use, or substantiate emissions inventories.<sup>7</sup>

1 U.S. Department of Energy, U.S. Environmental Protection Agency, World Resources Institute, Center for Resource Solutions and National Renewable Energy Laboratory. [Guide to Purchasing Green Power: Renewable Electricity, Renewable Energy Certificates, and On-Site Renewable Generation](#). Updated September 2018.

2 In addition to their role as a tracking and accounting mechanism, EACs may have value as financial support to an energy project, but that is not the focus of this paper.

3 GHG Protocol Scope 2 Guidance in 2015 defined energy attribute certificate as follows, “A category of contractual instrument that represents certain information (or attributes) about the energy generated but does not represent the energy itself. This category includes a variety of instruments with different names, including certificates, tags, credits, or generator declarations.”

4 International REC Standard Foundation. [Understanding EAC Schemes and Roadmaps for Their Development](#). Prepared for the European Union and the United Nations Development Program, September 2020.

5 Center for Resource Solutions, 2023. [The Legal Basis for Renewable Energy Certificates \(pdf\)](#).

6 For many EACs covering electricity generation, this unit is one megawatt-hour (MWh).

7 NREL, 2015. [Renewable Electricity: How do you know you are using it? \(pdf\)](#).

## Examples of EACs

A common type of EAC in North America is the renewable energy certificate (REC).<sup>8</sup> RECs are commonly used to substantiate compliance with state renewable energy requirements placed on certain electricity suppliers and voluntary claims of renewable energy delivery or use by electricity consumers.<sup>9</sup> There is no difference between RECs used for these two purposes, other than a given policy's or buyer's preference or requirement that the RECs convey certain underlying attributes, such as a specific time or place of generation.

Another example of EACs are zero-emissions credits (ZECs), also called emission-free energy certificates in some regions. This type of EAC is often associated with the generation of one megawatt-hour from a nuclear generator with zero emissions, though other qualifying conditions may apply. ZEC programs have been adopted by New York (2016), Illinois (2016), New Jersey (2018), and Connecticut (2017, established in 2022), in some cases as part of a state clean energy or renewable portfolio standard.

## Common EACs Uses

EACs are essential to substantiate claims made by electricity suppliers or consumers about the electricity they sell or use. **Without an EAC on which to base a claim, two different parties might count or claim the attributes of the same unit of electricity. This “double counting” results not only in conflicting claims that create confusion between the two parties, but those misleading claims may also skew the marketplace by falsely depicting a greater number of renewable claims than renewable usage.**

EACs help to prevent double counting because they allow only one account holder in a tracking system<sup>10</sup> to trade or retire EACs, and when the EAC is retired it can no longer be transferred.<sup>11</sup> In this way, an EAC provides a unique claim, whether that claim is made for compliance with a policy mandate by an electricity supplier, to substantiate voluntary green power use, or to make other claims regarding the use of a specific energy resource (further detail on these uses below). It is standard practice that any one EAC may be used to make only one of these claims: For instance, retirement of a REC may either allow the holder to make a claim of policy compliance or of voluntary use, but not both. In many states, this practice is written in statute or regulations.

**Compliance purposes.** Many states have adopted renewable or clean energy standards<sup>12</sup> that create a statewide compliance market require electricity suppliers to deliver minimum percentages of renewable electricity established by legislation. Suppliers must own and retire EACs—in the United States, typically RECs—to substantiate and verify claims of compliance with these requirements. EACs also could be used as a compliance mechanism for federal clean energy policies.

**Voluntary purposes.** Many consumers, large and small, want to purchase renewable electricity on the green power market that is different from the standard resource mix offered by their electricity supplier. Large consumers often make public claims about their use of renewable or other types of carbon-free electricity. EACs are essential to substantiate

<sup>8</sup> RECs represent the energy attributes of electricity generated from renewable sources. RECs are usually sold in one megawatt-hour (MWh) units. A certificate can be sold separately from the electricity with which it is associated. Once the REC is sold separately, the electricity is no longer considered renewable.

<sup>9</sup> For more information on RECs, see [Renewable Energy Certificates \(RECs\)](#); [Credible Claims](#); and [RECS: Making Green Power Possible](#).

<sup>10</sup> Certificate tracking systems are electronic registries used by energy producers, marketers, retailers, and consumers that underpin accurate claims of EAC ownership and energy use. They register producers, verify attributes and output quantities, issue EACs, and transfer EACs among participating account holders. Although the focus of some tracking systems is on renewable electricity, some U.S. tracking systems (NEPOOL GIS, NYGATS, and PJM GATs) issue and track energy attribute certificates for all generation, including nuclear and fossil resources. These are called simply “certificates,” but generically they are EACs that allow tracking administrators to account for all generation and to assign attributes appropriately. In some states, this is important to satisfy state environmental or energy disclosure requirements.

<sup>11</sup> To retire an EAC, a claimant must have an account in a tracking system and must transfer the EAC into a retirement subaccount from which it cannot be removed. In some tracking systems this may be called canceling or redeeming an EAC. If the claimant is not an account holder (like many consumers), the marketer from whom they purchased the EAC may retire it while crediting the claimant.

<sup>12</sup> Renewable portfolio standards, or RPSs, are the most common type of state clean energy standards. They typically require retail electricity suppliers to deliver specific percentages of electricity from eligible sources. Compliance must be substantiated by acquiring and retiring EACs (or RECs) in specified EAC tracking systems. Other compliance mechanisms, such as alternative compliance payments, may be accepted in lieu of delivering minimum percentages of renewable electricity.

these claims. For the supplier, EACs are used to substantiate and validate the quality and contents of the product or service the supplier is selling to consumers. For the buyer, EACs are retired to substantiate its claim of using electricity with certain characteristics, which a supplier can do by transferring EACs to the buyer’s account for retirement or simply retiring them on behalf of the buyer. Consumers also use EACs to ensure that their voluntary investments in and purchases of renewable electricity are not double-counted or also claimed towards compliance with an energy mandate; their purchases are thus incremental to, and go above and beyond, what would have happened absent their voluntary action. EACs offer the opportunity to demonstrate impact and prevent the attributes from being using and claimed by other consumers. For more information on U.S. voluntary markets, visit [EPA’s Renewable Energy Market Principles](#) page.

**Greenhouse gas accounting.** Companies and organizations that want to manage their carbon footprint generally create an inventory of the greenhouse gas (GHG) emissions for which they are responsible. To do so, they calculate the sources and quantities of the GHG emissions produced directly and indirectly by their activities. Once they have quantified their emissions, they are better equipped to identify the sources of these emissions and develop strategies to reduce them. The practice of inventorying an organization’s GHG emissions follows a set of standards and procedures established by the GHG Protocol.<sup>13</sup> An organization’s purchase of electricity is one source of emissions responsibility, as all electricity generation has an associated GHG emission rate (which can be zero in some cases), and this emission rate is one attribute identified in EAC. The GHG Protocol recognizes that “where attributes are not clear at the point of usage, allocation of energy attribute information is necessary to facilitate product-specific consumer claims.” The GHG Protocol thus requires the use of EACs to substantiate claims about emissions from electricity purchases.<sup>14</sup> For more information on corporate greenhouse gas accounting, visit EPA’s Center for Corporate Climate Leadership website.

**Power source and emissions disclosure.** Power source disclosure policies are requirements placed on electricity suppliers to provide information to consumers about the mix of energy resources used to generate the electricity sold to them. Implemented in about half of all U.S. states, these policies often require a standard reporting format to facilitate comparison across energy resource types, similar to food nutrition labels required by the U.S. Food and Drug Administration. Several states rely on EACs from their all-generation tracking systems to substantiate compliance with these policies.

## New Roles for EACs

Applications of EACs have expanded to meet new consumer and policy objectives. Examples of these potential new roles are described below.

**24/7 Hourly Matching.** There is growing interest in adding more detailed information to EACs regarding when electricity was generated to enable the matching of generation to the time of a consumer’s electricity use. This procurement approach could influence consumers to purchase generation from newer sources that are matched temporally and geographically relative to the consumer’s consumption or inform a shift in consumer demand to certain times of day to maximize reductions of system emissions. As of 2023 in the U.S., EACs are issued to generators monthly and are purchased to align with the total annual volume of a consumer’s electricity use. To realize the full benefits of 24/7 hourly matching, U.S.-based EAC tracking systems and grid operators would need to evolve to track attributes across a broader set of clean and conventional energy sources while supporting more temporally and locationally granular attribute information related to the generation represented by the EAC. For more on this topic, visit [EPA’s web page on 24/7 hourly electricity matching](#).

**Renewable natural gas.** Renewable natural gas (RNG) is a refined type of biogas (gas resulting from the decomposition of organic matter under anaerobic conditions) that when injected into a common carrier pipeline is indistinguishable from natural gas. It can be used in thermal applications, electricity generation, and vehicle fuel, and may be used on-site

<sup>13</sup> The [GHG Protocol](#), developed jointly by the World Resources Institute and the World Business Council for Sustainable Development, is the global standard for calculating corporate GHG emissions.

<sup>14</sup> [GHG Protocol Scope 2 Guidance](#). 2015.

or injected into natural gas pipelines.<sup>15</sup> Similar to tracking and allocating the use of undifferentiated electrons across the electric grid, EACs are a mechanism for tracking the energy attributes of gaseous fuels – such as the resource used to produce them — because the attributes cannot be distinguished once the gaseous fuel is injected into a common carrier pipeline. At least one attribute tracking system [has begun issuing EACs for RNG](#),<sup>16</sup> and the Center for Resource Solutions has created a new standard and certification program for biomethane products and their associated environmental attributes<sup>17</sup>, further demonstrating market interest.

## Conclusion

In a world of proliferating climate solutions, EACs play a necessary and important role in tracking, allocating, and substantiating claims of energy decarbonization. They also influence markets by facilitating the expression and aggregation of consumer preferences for specific energy products.<sup>18</sup> **EACs are an established tool for maintaining transparency and clarity in energy sector transactions, as well as a mechanism for facilitating credible innovations that can increase the pace and scale of clean energy growth.** A clear understanding of these certificates, along with more independently verifiable data about the attributes they convey, is needed to support the essential accounting and tracking functions they provide to important regulatory and voluntary energy decarbonization applications.<sup>19</sup>

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<sup>15</sup> U.S. Environmental Protection Agency, [Landfill Methane Outreach Program](#).

<sup>16</sup> [M-RETS Renewable Thermal Tracking System](#).

<sup>17</sup> Center for Resource Solutions, [Greene-e Standard for Renewable Fuels](#).

<sup>18</sup> [GHG Protocol Scope 2 Guidance](#). 2015.

<sup>19</sup> [The need for better insights into voluntary renewable energy markets](#). 2023.