

***CLIMATE LEADERS GREENHOUSE GAS INVENTORY PROTOCOL  
OPTIONAL MODULES METHODOLOGY  
for***

***Project Type:  
Green Power and Renewable Energy Certificates (RECs)***

Climate Protection Partnerships Division  
Office of Atmospheric Programs  
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*Climate Leaders is an EPA industry-government partnership that works with companies to develop comprehensive climate change strategies. Partner companies commit to reducing their impact on the global environment by setting aggressive greenhouse gas reduction goals and annually reporting their progress to EPA.*

## **Introduction**

An important objective of the Climate Leaders program is to focus corporate attention on achieving cost-effective greenhouse gas (GHG) reductions through internal projects, such as energy efficiency and on-site renewable energy projects. Partners have the ability to reduce their “direct emissions”, or GHG emissions which result from their activities and are emitted within their organizational boundary, and their “indirect emissions”, or GHG emissions which result from their activities but are emitted from sources owned or controlled by another entity. The most common source of indirect emissions is purchased electricity.

In addition to implementing internal reduction projects, Partners may use external reductions, such as purchases of green power, to achieve their GHG reduction goals. This guidance addresses the eligibility of green power purchases from both contracts with a utility and through Renewable Energy Certificates (RECs) to reduce indirect emissions from electricity use to help Climate Leaders Partners achieve their GHG reduction goal. The document provides Partners with a performance standard (accounting methodology), measurement, and monitoring guidance. The guidance provided in this document does not apply to on-site renewable energy generation,<sup>1</sup> non-grid-connected renewable energy, or direct emissions reductions that may result from a project (e.g. destruction of captured methane).<sup>2</sup> Eligibility requirements in this guidance are consistent with EPA’s Green Power Partnership requirements.<sup>3</sup>

## **Background**

The calculation of indirect emissions from electricity purchases should reflect a transparent accounting of the physical emissions profile of purchased electricity from a dedicated “off-grid” plant or from the grid. The emission rate for electricity generation depends on the type of fuel used and the fuel conversion efficiency of the generating facilities. In the case of grid-related purchases, Partners should use published emission

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<sup>1</sup> In the case of on-site renewable generation owned by the Partner (where no RECs are sold to the voluntary market), no adjustment to the GHG inventory is required as the reduced emissions from on-site fuel use and electricity purchases will be reflected in the inventory.

<sup>2</sup> Reductions of direct GHG emissions, such as from the direct capture and destruction of methane, need not be conveyed to the purchaser of electricity or RECs. Other guidance documents present the methodologies to be used for quantifying these direct GHG emission reductions.

<sup>3</sup> See [http://epa.gov/greenpower/documents/gpp\\_partnership\\_regs.pdf](http://epa.gov/greenpower/documents/gpp_partnership_regs.pdf) for EPA Green Power Partnership Requirements

factors for each facility's geographic location corresponding to the annual average emissions rate of electric generators supplying power to the grid in that region.<sup>4</sup>

Green power purchases are an effective way to reduce an organization's GHG emissions from electricity use. Green power is a subset of renewable energy and represents those renewable energy resources and technologies that provide the highest environmental benefit. EPA defines green power as electricity produced from solar, wind, geothermal, biogas, biomass, and low-impact small hydroelectric sources. Green power sources produce electricity with an environmental profile superior to conventional power technologies and produce no anthropogenic (human caused) greenhouse gas emissions. Customers often buy green power for avoided environmental impacts and its greenhouse gas reduction benefits.

The generation of green power reduces GHG emissions by reducing the amount of fossil fuels that would otherwise be consumed to generate electricity. Purchasing green power contractually conveys the rights to the environmental benefits of the generation source. Therefore, green power purchases are eligible to reduce a Partner's GHG emissions as part of achieving the Partner's Climate Leaders GHG reduction goal.

The emission reductions associated with green power purchases are indirect and may be used only to reduce the purchaser's indirect emissions from electricity use. Direct emissions reductions resulting from green power purchases are typically realized at conventional generating facilities owned by entities other than the green power purchaser or supplier. The concept of "ownership" of carbon reductions to avoid potential double counting of GHG emissions reductions is important to the credibility of voluntary offsets and renewables markets. Typically, ownership of GHG reductions from projects is dealt with on a contractual basis in voluntary markets, rather than allocation or certification by a government entity as part of a mandatory program. Green power transactions do not generally have a contractual mechanism to tie them to an emission reduction at a conventional generating facility.

Calculating direct reductions is also complicated by the difficulty in determining which specific generating facilities' emissions are displaced by the renewable energy generation. There is considerable uncertainty within grid systems as to which and how much generation is displaced with the delivery of renewable energy onto the grid. Emissions reductions will vary by technology and time of operation. For example, wind may be more likely to displace baseload units operating at night, whereas solar is more likely to displace emissions from intermediate and peaking units. Renewable energy generation may displace existing fossil generation (the operating margin) or reduce the

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<sup>4</sup> Partners should refer to Climate Leaders Core Module Guidance: Indirect Emissions from Purchases/Sales of Electricity and Steam to calculate indirect emissions from electricity use for their Climate Leaders GHG inventory ([http://www.epa.gov/climateleaders/documents/resources/indirect\\_electricity\\_guidance.pdf](http://www.epa.gov/climateleaders/documents/resources/indirect_electricity_guidance.pdf)).

need to build new fossil generation (the build margin). This document makes several simplifying assumptions in the choice of emissions factors for the calculation of GHG reductions from green power purchases.

## Description of Project Type

This section provides a detailed description of the project type covered by this document. It also describes how the project boundary is defined and how leakage is addressed.

**Technology/Practice Introduced.** Green power may be purchased in two primary ways. In this guidance document, “green power” is used to describe either of the following products.

- **Utility Products:** Consumers in many states have the ability to choose the type of electricity product they purchase, depending on the status of utility restructuring in that state. Some utilities offer an optional electricity service, commonly referred to as a *green pricing product* or *green marketing product*. In competitive markets, customers can switch electric service providers if their current provider does not offer a green power option. Buyers typically pay a small premium in exchange for electricity generated from green power resources.
- **Renewable Energy Certificates (RECs):** Whether or not consumers have the opportunity to purchase utility green power products, they can buy RECs, which are market-based instruments designed to facilitate transactions between buyers and sellers of renewable electricity. RECs have been known as green tags, green energy certificates, or tradable renewable certificates. A REC represents the rights to the environmental, social, and other non-power qualities of renewable electricity generation. A REC, and its associated attributes and benefits, can be sold separately from the underlying physical electricity associated with a renewable-based generation source. A REC provides exclusive proof that one megawatt-hour (MWh) of renewable energy has been generated.<sup>5</sup> It also allows the purchaser to make certain statements regarding associated environmental attributes.<sup>6</sup>

EPA encourages, but does not require, the purchase of third-party certified and verified green power as a matter of best practice in green power procurement. Purchase of third-party certified and verified products helps to ensure the quality of the products and that the Regulatory Eligibility and Additionality criteria described below are met.

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<sup>5</sup> This statement is true for RECs purchased from regions with tracking systems or certified RECs. Additional due diligence might be required to verify this for other RECs purchases.

<sup>6</sup> Environmental attributes can be either renewable generation attributes (including fuel, technology, vintage, and location) or indirect emissions reduction statements where appropriate (i.e. for emissions not subject to cap & trade or comparable legal constraint).

The guidance provided in this document does not apply to on-site renewable energy generation, non-grid-connected renewable energy projects, or direct emissions reductions that may result from a project (e.g. destruction of captured methane).

**Project Size/Output.** This accounting methodology applies to green power purchases regardless of the quantity purchased.

**Project Boundary.** This section provides guidance on which physical components, and associated greenhouse gases, must be included in the project boundary for a green power purchase.

**Physical Boundary.** The physical boundary of the project includes the renewable energy facility or facilities from which green power is purchased. It also includes the conventional generating facilities in the electricity grid served by the renewable energy facility, as the emission reductions will occur at these facilities.

**GHG Accounting Boundary.** The GHG accounting boundary for green power purchases includes all CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions. The GHG accounting boundary includes primarily the CO<sub>2</sub> emissions from the combustion of fossil fuels at grid-connected generating facilities, and also at any non-renewable generating facilities that may be included in the green power product. Other minor sources of GHGs are CH<sub>4</sub> and N<sub>2</sub>O as byproducts of combustion.

**Temporal Boundary.** Green power is identified by the year, or “vintage”, of its generation. For the purpose of tracking progress towards a Partner’s reduction goal, all green power purchases should be generated in the year that the green power is reported, up to 6 months before the reporting year, or up to 3 months after the reporting year.

**Leakage.** Leakage is an increase in greenhouse gas emissions or decrease in sequestration caused by the project but not accounted for within the project boundary. The underlying concept is that a particular project can produce offsetting effects outside of the physical boundary that fully or partially negate the benefits of the project. Although there are other forms of leakage, for this performance standard leakage is limited to activity shifting – the displacement of activities and their associated GHG emissions outside of the project boundary.

Green power purchases are not expected to result in leakage of greenhouse gases outside the project boundary. If it is determined that significant emissions that are reasonably attributable to the project occur outside the project boundary, these emissions must be monitored, quantified and included in the calculation of reductions; however, no specific quantification methodology is required.

## Regulatory Eligibility

This section describes the regulatory eligibility requirements for green power purchases. In order for a green power purchase to be eligible for helping achieve a Partner's reduction goal, GHG emissions must be reduced below the level effectively required by any existing federal, state, or local regulations. This requirement consists of two eligibility tests involving 1) the construction of the green power facilities and 2) the purchase of green power.

**Green Power Facilities.** Green power may not be used to adjust a GHG inventory if it is purchased from a green power facility that has been:

1. Mandated by a local, state or federal government agency, e.g., in a consent decree;
2. Mandated specifically by a renewable portfolio standard (RPS); or
3. Required under any other legal agreement.

**Green Power Purchase.** The provision or purchase of green power must not be required under any settlement agreement or environmental compliance agreement or otherwise required by a local, state, or federal agency. The green power must not be required under or used to satisfy renewable portfolio standard mandates or goals imposed by federal, state, or local governments on utilities or load-serving entities.

Any RECs sold by renewable facilities into a voluntary REC market are considered to be additional to the amount of green power needed to meet the requirements of an RPS. This is true even if the renewable facility applies or sells a portion of its output and/or RECs to meet the requirements of an RPS. For example, while the RPS may have been a primary motivation for building the renewable facility, the fact that all its RECs are not sold to meet the RPS indicates that either 1) to take advantage of economies of scale, the plant capacity was increased beyond that needed to satisfy the RPS, 2) that the RPS requirements have been satisfied by other renewable energy supplies without the need for the facility's full output, or 3) that the voluntary markets provide a more attractive sale option than compliance markets.

The following are circumstances in which EPA has recognized the green power purchase as incremental:

1. The green power purchase is a result of an obligation placed on federal, state or local government agencies as end-users of energy such as a state or federal executive order.
2. The green power is included as a voluntary measure in a State Implementation Plan (SIP). Although SIPs are mandated, they do not set mandatory

requirements for use or purchase of renewable energy. Therefore, a purchase of green power under a SIP is considered a voluntary purchase.

## **Determining Additionality**

This section describes the performance threshold (additionality determination) that a green power purchase must meet or exceed in order to be eligible for helping achieve a Partner's reduction goal.

The additionality determination represents a level of performance that, with respect to emission reductions, technologies or practices, is significantly better than average compared with recently undertaken practices or activities in a relevant geographic area. Any project that meets or exceeds the performance threshold is considered "additional" or beyond that which would be expected under a "business-as-usual" scenario.

The type of performance threshold used for eligible green power purchases is practice-based. The practice-based performance threshold represents a level of "performance" that is beyond that expected of typical electricity generation and purchases, and is based on the range of current practices.

The additionality determination consists of two tests, involving 1) the construction of the green power facilities; and 2) the purchase of green power.

**Green Power Facilities.** Though the construction of green power facilities has accelerated in recent years, renewable energy is still a small percentage of generation nationwide, for which supporting data are presented in Appendix I. Based on these data, constructing green power facilities is considered "beyond business-as-usual" and, therefore, additional.

**Eligible Resources.** Green power facilities must generate electricity with zero anthropogenic, or human-caused, GHG emissions and have an environmental profile superior to conventional power generation. The following criteria define which green power resources are considered additional, and are therefore eligible to adjust indirect electricity emissions.<sup>7</sup> A complete list is included in Appendix II.

- Solar photovoltaic
- Wind
- Geothermal

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<sup>7</sup> These eligibility requirements are based on the U.S. EPA's Green Power Partnership requirements and are subject to update as the Green Power Partnership updates its requirements. See [http://www.epa.gov/greenpower/documents/gpp\\_partnership\\_reqs.pdf](http://www.epa.gov/greenpower/documents/gpp_partnership_reqs.pdf).



- Hydropower – certified by the Low-Impact Hydro Institute or certain other hydropower resources (see Appendix II). Green power contracts from hydropower facilities of less than 30 MW capacity will be honored until those contracts expire if the contract was in place prior to April 30, 2006.
- Eligible Biomass
- Co-firing of eligible forms of biomass with non-renewables is accepted under certain conditions.
- Biodiesel (B100) (see Appendix II)
- Fuel Cells – using the above eligible fuels

For green power products that contain a mix of conventional, ineligible renewable energy, and green power, only the green power portion of a product is eligible towards adjusting indirect electricity emissions.

**New Renewables Requirement.** In order to support the development of new renewable facilities, only green power from “new” green power facilities is eligible. The voluntary green power market is considered to have begun in 1997. Green power facilities placed into service after January 1, 1997 are said to produce “new” renewable energy.<sup>8</sup>

In addition, the following criteria also qualify an eligible renewable generating facility as a “new” facility:

1. The facility has been re-powered on or after January 1, 1997 such that 80% of the fair market value of the project derives from new generation equipment installed as part of the re-powering. Total fair market value is determined by assessing the total costs of capital investments made as part of the repowering of equipment and must include replacement of the prime generating equipment. The total fair market value must be assessed at the point in time when the facility became operational after repowering.
2. A separable improvement to or enhancement of an existing operating facility provides incremental generation that is contractually available for sale and separately metered from the existing generation at the facility.
3. The facility is a biomass co-firing operation that meets the eligibility requirements as described in Appendix II, and began co-firing eligible biomass with non-eligible fuels on or after January 1, 1997.
4. The facility is a separately metered landfill gas resource that was not being used to generate electricity prior to January 1, 1997.

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<sup>8</sup> An exception may be made, on a case-by-case basis, for facilities placed online prior to 1997 that were developed specifically for utility green pricing programs.

**Green Power Facility Location.** Green power facilities from which green power is purchased must be located in the United States to be eligible to reduce the Partner's U.S. GHG emissions. If the inventory also includes international operations, international green power facilities may also be eligible, provided they meet the regulatory eligibility and additionality requirements of this document.

**Green Power Purchase.** The following criteria define which green power purchases are considered additional, and are therefore eligible.

- The green power must not be included in an undifferentiated power product, e.g., standard electricity service or utility system mix.
- The green power must not be paid for by all customers, e.g., in a utility's standard rates.
- The green power must not be purchased in lieu of paying a system benefits charge for renewable energy, e.g., a self-directed system benefits charge.
- For REC purchases, once a REC is unbundled from electricity, the electricity must not be marketed or sold in any way as "renewable" or "green power" on the wholesale or retail market, including as part of a state or regional public disclosure law.
- The green power purchase should include a contractual attestation ensuring no double-sale of the avoided GHG claim.
- Once a claim is made based on RECs or green power purchases, the associated RECs cannot be resold and are, in effect, retired (preferably in an electronic REC tracking system, if one is available).
- Green power must not be sourced from a region that has a mandatory GHG cap in place for power plant emissions or similar regulatory mechanism, unless allowances are retired or set-aside pre-allocation, such as in the Regional Greenhouse Gas Initiative (RGGI). For purchases from those states to be eligible and result in GHG emission reduction claims, they must meet state requirements.<sup>9</sup>

**Vintage.** Green power is identified by the year, or "vintage", of its generation. For the purpose of tracking progress towards a Partner's reduction goal, all green power purchases should be generated in the year that the green power is reported, up to 6 months before the reporting year, or up to 3 months after the reporting year.

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<sup>9</sup> An exception may be made to this provision subject to the design and final implementation of the GHG policy. The RGGI model rule includes an optional clause that would require preallocation retirement of carbon allowances to preserve green power marketing claims. Several RGGI states are including similarly worded provisions in their policies.

## Quantifying Emission Reductions

This section defines the procedures for quantifying the emission reductions from green power purchases. It addresses issues pertaining to defining a baseline, as well as calculating and monitoring reductions.

**Selecting and Setting an Emission Baseline.** The emission baseline for green power purchases is the actual quantity of indirect emissions that would be generated in the absence of green power purchases. The calculation of indirect emissions from electricity purchases should reflect a transparent accounting of the physical emissions profile of purchased electricity from a dedicated “off-grid” plant or from the grid. The emission rate for electricity generation depends on the type of fuel used and the fuel conversion efficiency of the generating facilities.

These baseline indirect emissions should be tracked separately from any adjustments made to reduce indirect emissions from electricity use from contractual purchases of green power for tracking progress towards a Partner’s reduction goal.

**Estimating Project Emission Reductions.** This section presents the procedures used to estimate GHG emission reductions from green power purchases. This is done using Equation 1 below. Initial estimates of the reductions can be made using assumptions for the amount of green power purchased and the location of the renewable energy facility.

Equation 1

$$\text{Inventory adjustment}_i = GP \times (ERate_{baseline,i} - ERate_{project,i})$$

Where:

Inventory adjustment <sub>i</sub>	= Reduction of gas due to green power purchase (e.g., lb)
GP	= Green power purchased (e.g., MWh)
$ERate_{baseline,i}$	= Gas emission rate for avoided emissions (e.g., lb CO <sub>2</sub> /MWh, lb CH <sub>4</sub> /MWh, lb N <sub>2</sub> O/MWh)
$ERate_{project,i}$	= Gas i emission rate for project emissions (e.g., lb CO <sub>2</sub> /MWh, lb CH <sub>4</sub> /MWh, lb N <sub>2</sub> O/MWh)

GP is the quantity of green power purchases that meet the eligibility requirements defined in this guidance document. Utility products may contain a mix of eligible green power and other generation that is not eligible, such as nuclear, large-scale hydro, or fossil fuel.<sup>10</sup> The quantity used for GP should only include the fraction of purchases that are from eligible renewables. For example, consider a purchase of 1,000 MWh of a

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<sup>10</sup> Many states have disclosure laws which require providers to supply this information. Purchase of third-party certified green power products will generally provide for generation disclosure information.

green power product that contains 50% eligible renewables and 50% combined-cycle natural gas. GP would equal 50% of 1,000 MWh, or 500 MWh.

For green power purchased from U.S. renewable facilities, the default emission rate for  $ERate_{baseline,i}$  is EPA's Emissions & Generation Resource Integrated Database (eGRID) non-baseload emission rate for the eGRID subregion(s)<sup>11</sup> in which the renewable electricity was generated. The most current eGRID emission rates published should be used at the time the inventory adjustment is calculated.

eGRID provides annual output emission rates for non-baseload electricity generation, which is considered to be generation from power plants that combust fuel and have capacity factors less than 0.8. Capacity factor is used as a surrogate for dispatch order to identify baseload and non-baseload generation. As electric load increases, non-baseload generation is typically dispatched after baseload generation. As load decreases, non-baseload output is also typically reduced first. Therefore, non-baseload generation is most likely to be displaced by renewable energy generation, while baseload generation would generally be unaffected. Using the non-baseload emission rate for the eGRID subregion(s) in which the renewable energy was generated best characterizes the conventional electricity generation that is displaced by a typical renewable energy facility, while still using published data that are transparent and readily available. The exclusion of baseload generation from the calculation of emission rates is a widely accepted approach internationally.

The location of the renewable energy facility or facilities from which the green power is sourced should be requested from the green power supplier. If the facilities are located in multiple subregions, the calculation in Equation 1 should be repeated for each subregion, using the amount of green power purchased from each subregion.

For green power purchased from international renewable facilities, the emission rate used for  $ERate_{baseline,i}$  should be a non-baseload emission rate, if available. Otherwise, a system average emission rate should be used. Regional emission rates are preferable if available, but national average rates can also be used for non-U.S. locations.

Because the quantity of green power (GP) includes only eligible renewable resources,  $ERate_{project,i}$  will be zero.

## Monitoring

Climate Leaders Partners should monitor the following parameters on an annual basis:

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<sup>11</sup> An eGRID subregion represents a portion of the U.S. power grid that is contained within a single North American Electric Reliability Council (NERC) region. Most of eGRID's subregions consist of one or more power control areas (PCAs). An eGRID subregion generally represents sections of the power grid that have similar emissions and resource mix characteristics and may be partially isolated by transmission constraints (<http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>).

- Confirm the quantity of green power purchased. The final purchase quantity may not be specified in the initial green power purchase agreement. For example, agreements may be based on the expected quantity needed to equal a certain percentage of a facility's or organization's electricity consumption. The final quantity may then be determined after the end of a year. This quantity should be confirmed through contracts or other documentation.
- Confirm the location of the renewable energy facilities from which the green power is purchased. Suppliers of RECs or green power products based on RECs typically purchase RECs from multiple renewable energy facilities. Suppliers allocate RECs from the various renewable facilities to specific green power purchasers, but this often takes place after the year has ended.
- Confirm that the regulatory eligibility and additionality requirements listed above are met for that year's purchases. The purchase of third-party certified and verified green power helps to confirm this fact.

**Calculating Actual Project Reductions.** The quantification of actual GHG emission reductions occurs after the green power purchase has been completed and monitored. To quantify the reduction, apply the equations presented in the section on estimating project emission reductions, using actual monitored project data rather than estimates.

-----**Box 1**-----

**Sale of RECs from On-site Green Power Generation**

An on-site green power system owned by a Partner, such as a photovoltaic system, may generate RECs that are eligible for sale in the voluntary market or to a utility to meet the utility's requirements under a state RPS. Selling the RECs transfers the owner's claim for the environmental attributes of the system to the buyer of the RECs. For example, as described in this guidance document, for RECs sold into the voluntary market, the buyer of those RECs may adjust the indirect emissions in their GHG inventory to show an emission reduction. To avoid double-counting of the emission reductions resulting from a green power system, the system owner that sells RECs may not also claim a reduction in GHG emissions.

To account for REC sales in Climate Leaders reporting, the seller must report indirect emissions for the electricity associated with the RECs sold. These emissions should be calculated using the non-baseload subregional grid emission factor corresponding to the region of electricity generation, as found in Appendix III.

In addition, Partners may host an on-site green power system at their facility without owning the system. For example, a third party may own the system and sell electricity to the Partner through a Power Purchase Agreement. Partners should follow Climate Leaders calculation guidance for grid-based electricity purchases, as detailed in the Climate Leaders document *Indirect Emissions from Purchases/Sales of Electricity and Steam*, if they do not contractually retain the RECs from these systems. If the Partner does retain the RECs from the green power system, the electricity purchased from the system is assigned the emission factor of the system. In the case of 100% green power, the emission factor will be zero.

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## Appendix I. Development of the Performance Threshold – Dataset

This appendix provides information on renewable energy facilities and green power sales, in relation to conventional electricity generation and sales. The information indicates that the construction of renewable energy facilities and the purchase of green power are both accelerating. Despite this, renewable energy facilities still represent a small fraction of electricity capacity and generation, and green power purchases still represent a small fraction of electricity sales.

**Table I.a. U.S. Generator Capacity and Electricity Generation, 2006**

Energy Source	Total Existing Capacity (MW)	Percent of Existing Capacity	2006 Added Capacity (MW)	Percent of Added Capacity	Net Generation (Thousand MWh)	Percent of Total Generation
Coal	335,830	31%	603	5%	1,990,926	49%
Petroleum	64,318	6%	184	1%	64,364	2%
Natural Gas	442,945	41%	9,491	72%	813,044	20%
Other Gases	2,563	0.2%	0	0%	16,060	0.4%
Nuclear	105,585	10%	0	0%	787,219	19%
Hydroelectric Conventional	77,419	7%	2	0.02%	289,246	7%
Other Renewables	26,470	2%	2,872	22%	96,423	2%
Pumped Storage	19,569	2%	n/a	n/a	-6,558	-0.2%
Other	976	0.1%	0	0%	13,977	0.3%
<b>Total</b>	<b>1,075,677</b>		<b>13,152</b>		<b>4,064,702</b>	

Source: EIA (2007) Electric Power Annual 2006. Energy Information Administration, Washington, DC. DOE/EIA-0348(2006).

The National Renewable Energy Laboratory estimates that in 2006, U.S. retail sales of voluntary green power totaled 11.9 billion kWh, representing about 0.3% of total electricity sales.<sup>12</sup> Voluntary green power sales increased 40% in 2006, following an increase of 37% in 2005.

<sup>12</sup> NREL (2007) Green Power Marketing in the United States: A Status Report (Tenth Edition). National Renewable Energy Laboratory, Golden, Colorado. NREL/TP-670-42502.

## **Appendix II. Development of the Performance Threshold – Eligible Renewable Resources** **(from U.S. EPA’s Green Power Partnership)**

The following is a detailed list of eligible renewable resources that meet EPA's green power criteria:

1. Solar photovoltaics;
2. Wind;
3. Geothermal;
4. Hydropower from new generation capacity on a non-impoundment or new generation capacity on an existing impoundment that meets one or more of the following conditions:
  - a. Hydropower facilities certified by the Low Impact Hydropower Institute;
  - b. Run-of-the-river hydropower facilities equal to or less than 5 MW nameplate capacity;
  - c. Hydropower facilities that consist of a turbine in a pipeline or a turbine in an irrigation canal; and/or
  - d. The EPA will consider on a case-by-case basis new incremental capacity on an existing dam, where the “new” output is equal to or less than 5 megawatts.

EPA will consider adopting ocean-based resources and will review these technologies as they mature and as practical application reaches near term.

5. Biomass - Solid, liquid, and gaseous forms from the following fuels:
  - a. Woody waste;<sup>4</sup>
  - b. Agricultural crops or waste;
  - c. Animal and other organic waste;
  - d. Energy crops;
  - e. Landfill gas and wastewater methane; and

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<sup>4</sup> Includes “black liquor” from pulp and paper processing, mill residues, industrial waste wood, and waste wood from woodworking or wood processing, so long as the wood is not chemically treated or coated.



- f. Municipal Solid Waste is eligible if it meets EPA green power criteria.

Biomass resources excluded from eligibility include:

- a. Wood that has been coated with paints, plastics, or formica
- b. Wood that has been treated for preservation with materials containing halogens, chlorine or halide compounds like CCA-treated materials, or arsenic. (CCA = chromated copper arsenate)

Qualified wood fuels may contain de minimis quantities (less than 1% of total wood fuel) of the above excluded contaminants.

6. Biodiesel (B100) that is used to generate electricity is eligible for EPA's Green Power Partnership if the following conditions are met:
  - a. The biodiesel is separately measured (and verified) from the petroleum diesel, and
  - b. Contracts are in place to allow a third party to verify that the biodiesel was converted to electricity.

Only the amount of electricity generated from the biodiesel may be counted as an eligible renewable resource.

7. Fuel Cells are eligible only if powered by hydrogen derived from any of the above eligible renewable resources.

### **Co-firing of Biomass with Non-Renewables**

Co-firing of eligible forms of biomass with non-renewables is permitted if at least one of the following conditions is met:

1. The facility is located in an electric system control area that makes use of a generation tracking system (e.g., NEGIS, PJM-GATS, WREGIS) that is fully capable of accurately measuring and reporting the differentiated (biomass-fired and non-biomass-fired) electrical output from the facility; or,
2. The biomass is in a gaseous or liquid state, is separately metered and there are contracts in place to verify that the biomass portion was converted to electricity; or,

3. Facilities that do not meet either of the criteria above may be eligible subject to a case-by-case review by EPA. The methodology presented to EPA must demonstrate that the Btu value of the electrical output from the facility is attributed to the eligible biomass fuel. Some of the criteria that EPA will consider in making their decision are:
  - a. Whether the facility was modified to accept biomass fuel;
  - b. Whether there is an independent entity involved in verifying or determining the appropriate measurement;
  - c. Whether there is a way to determine and ensure the net electricity increment being sold as "renewable" can be attributed to eligible biomass fuel. EPA would prefer a verification methodology that can be applied universally.

Only the amount of electricity generated from the eligible biomass may count towards the EPA criteria.

## Appendix III. Tables for estimating and calculating emissions.

### *2004 Carbon Dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O) Emission Factors for Utility Non-Base Load Units (Based on eGRID2006)*

eGRID 2006 Subregion	eGRID 2006 Subregion Name	eGRID 2006 2004 Emission Rates		
		(lbs CO <sub>2</sub> /MWh)	(lbs CH <sub>4</sub> /MWh)	(lbs N <sub>2</sub> O/MWh)
AKGD	ASCC Alaska Grid	1,435.50	0.0351	0.0072
AKMS	ASCC Miscellaneous	1,441.86	0.0734	0.0135
AZNM	WECC Southwest	1,434.17	0.0256	0.0083
CAMX	WECC California	1,279.38	0.0420	0.0059
ERCT	ERCOT All	1,334.71	0.0246	0.0067
FRCC	FRCC All	1,475.02	0.0586	0.0131
HIMS	HICC Miscellaneous	1,625.08	0.1410	0.0250
HIOA	HICC Oahu	1,730.31	0.1034	0.0186
MROE	MRO East	2,088.15	0.0474	0.0291
MROW	MRO West	2,216.60	0.0481	0.0356
NEWE	NPCC New England	1,403.61	0.0772	0.0159
NWPP	WECC Northwest	1,531.53	0.0655	0.0195
NYCW	NPCC NYC/Westchester	1,776.26	0.0654	0.0108
NYLI	NPCC Long Island	1,485.66	0.0595	0.0107
NYUP	NPCC Upstate NY	1,705.58	0.0538	0.0202
RFCE	RFC East	1,814.36	0.0394	0.0248
RFCM	RFC Michigan	1,948.86	0.0307	0.0286
RFCW	RFC West	2,084.06	0.0266	0.0319
RMPA	WECC Rockies	1,698.22	0.0239	0.0194
SPNO	SPP North	2,192.44	0.0302	0.0306
SPSO	SPP South	1,506.24	0.0281	0.0137
SRMV	SERC Mississippi Valley	1,410.63	0.0461	0.0098
SRMW	SERC Midwest	2,150.44	0.0262	0.0320
SRSO	SERC South	1,809.97	0.0443	0.0272
SRTV	SERC Tennessee Valley	2,047.99	0.0315	0.0320
SRVC	SERC Virginia/Carolina	1,917.35	0.0503	0.0284
<b>Total US</b>		<b>1,714.40</b>	<b>0.0404</b>	<b>0.0205</b>

Note: CH<sub>4</sub> and N<sub>2</sub>O factors are based on the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005*, EPA 430-R-07-002, Washington, DC, April 2007 (Annex 3, Table A-69).



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