

Resources for Additional Information

To view the full Guide, visit https://www.epa.gov/greenpower/guide-purchasing-green-power

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U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency's (EPA's) Green Power Partnership is a voluntary program that encourages organizations to buy green power as a way to reduce the environmental impacts associated with purchased electricity use. The partnership works with hundreds of partner organizations voluntarily purchasing billions of kilowatt-hours of green power annually. Partners include a wide variety of leading organizations such as Fortune 500 companies; small and medium-sized businesses; local, state and federal governments; and colleges and universities. In addition to the Green Power Partnership, EPA hosts other websites and tools that provide support for initiatives on clean power or energy efficiency.

- U.S. EPA's Green Power Partnership: www.epa.gov/greenpower
- U.S. EPA's Green Power Partnership Requirements. https://www.epa.gov/greenpower/green-power-partnership-requirements
- U.S. EPA's Green Power Leadership Awards: <u>https://www.epa.gov/greenpower/green-power-leadership-awards</u>
- Clean Energy: <u>https://www.epa.gov/energy/clean-energy-programs</u>

- Center for Corporate Climate Leadership: www.epa.gov/climateleadership
- GRID Database: www.epa.gov/climateleadership
- ENERGY STAR: www.energystar.gov
- Landfill Methane Outreach Program: www.epa.gov/lmop
- Power Profiler: https://www.epa.gov/energy/power-profiler

U.S. Department of Energy

The Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) works to strengthen the United States' energy security, environmental quality and economic vitality through public-private partnerships. It supports this goal by enhancing energy efficiency and productivity and by bringing clean, reliable and affordable energy technologies to the marketplace.

As a part of EERE, the Department of Energy's Federal Energy Management Program (FEMP) facilitates the federal government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship. FEMP provides project transaction services, applied technology services and decision support services. All of these services are available to federal agencies deploying renewable technologies.

- Federal Energy Management Program:
 https://energy.gov/eere/femp/federal-energy-management-program
- FEMP Renewable Energy Procurement:
 https://energy.gov/eere/femp/renewable-energy-procurement-federal-agencies

World Resources Institute

World Resources Institute (WRI) is an environmental think tank that goes beyond research to find practical ways to protect the Earth and improve people's lives. WRI's mission is to move human society to live in ways that protect the Earth's environment and its capacity to provide for the needs and aspirations of current and future generations. Its work is organized around six critical goals that the world must achieve by 2020 in order to secure a sustainable future:

- **Climate.** Protect communities and natural ecosystems from damage caused by greenhouse gas emissions, and generate opportunities for people by catalyzing a global transition to a low-carbon economy.
- **Energy.** Drive the scale-up of clean, affordable power systems throughout the world to deliver sustainable socio-economic development.
- **Food.** Ensure the world's food systems reduce their impact on the environment, drive economic opportunity and sustainably feed 9.6 billion people by 2050.
- **Forests.** Alleviate poverty, enhance food security, conserve biodiversity and mitigate climate change by reducing forest loss and restoring productivity to degraded, deforested lands.
- Water. Achieve a water-secure future by mapping, measuring and mitigating global water risks.
- **Sustainable Cities.** Improve quality of life in cities by developing and scaling environmentally, socially and economically sustainable urban and transport solutions.

WRI has been engaging the private sector on sustainability and clean energy for more than a decade. Beginning with the original Green Power Market Development Group, WRI has been at the forefront of expanding corporate procurement of green power. Today, WRI's Electricity Initiative convenes an action-oriented group of member companies with utilities to expand clean energy in China, India, the United States and across Southeast Asia and Latin America. The initiative drives alignment and investment in electricity markets to deliver on consumer demand for an affordable transition to clean energy. WRI is also a founding partner of the Renewable Energy Buyers Alliance.

- World Resources Institute Electricity Initiative: http://www.wri.org/our-work/project/electricity-initiative
- Greenhouse Gas Protocol: http://www.ghgprotocol.org/

Green-e Certification Programs

Center for Resource Solutions' Green-e certification program is the leading certification and verification program for renewable energy in the United States and Canada. It is a voluntary consumer-protection program that certifies superior renewable energy options offered by utilities and marketers in the voluntary renewable energy market. It is administered by Center for Resource Solutions, a nonprofit based in San Francisco. All Green e standards are stakeholder-driven, and all requirements and auditing protocols are publicly available. Green-e also works with businesses to certify renewable energy and climate commitments, verify claims, and provide accurate promotional tools. Green-e also certifies carbon offset products.

Renewable energy products that meet the Green-e standards, as well as businesses recognized by Green-e that are using certified renewable energy and products made with certified renewable energy, are identified by the Green-e logo.

The Green-e website, https://www.green-e.org, is a widely used resource that allow consumers to find certified products by state and to select the superior green power option that meets their needs.

- Center for Resource Solutions: https://resource-solutions.org
- Green-e: https://www.green-e.org

Additional Resources

The Additional Resources section is not intended to be an exhaustive list of all resources on a certain subject, but rather an introduction to a topic of interest.

Why Purchase Green Power

Business Renewables Center: A member-based platform, hosted by Rocky Mountain Institute, that aims to accelerate corporate purchasing of off-site, large-scale wind and solar energy. http://businessrenewables.org/

Climate Savers: World Wildlife Fund program encouraging businesses as leaders of the low-carbon economy. http://climatesavers.org/

Corporate Renewable Energy Buyer's Principles: An effort to communicate what buyers need from the marketplace and how much renewable energy they are seeking.

http://buyersprinciples.org/

RE100: Amplifying the voice and supporting the largest companies with a goal to buy 100 percent renewable energy. http://there100.org/

Renewable Energy Buyers Alliance: A network of non-profit organizations helping companies understand the benefits of moving to renewables, connecting corporate demand to renewable energy supply, and helping utilities better understand and serve the needs of corporations. http://rebuyers.org/

Current State of Green Power Markets

Lazard. (2017). *Lazard's levelized cost of energy analysis—version 10.0*. Retrieved from https://www.lazard.com/media/450337/lazard-levelized-cost-of-energy-version-110.pdf

O'Shaughnessy, E., Heeter, J., Cook, J., and Volpi, C. (2017). Status and trends in the U.S. voluntary green power market (2016 data) (p. 21). National Renewable Energy Laboratory. Retrieved from https://energy.gov/eere/analysis/downloads/status-and-trends-us-voluntary-green-power-market

States with Customer Choice of Suppliers

Borenstein, S., and Bushnell, J. (2015). *The U.S. electricity industry after 20 years of restructuring.* Energy Institute at Haas. Retrieved from https://ei.haas.berkelev.edu/research/papers/WP252.pdf

U.S. Department of Energy. *A primer on electric utilities, deregulation and restructuring of U.S. electricity markets* (2002). Retrieved from http://www.pnl.gov/main/publications/external/technical_reports/PNNL-13906.pdf

Purchasing Guidance

Center for Resource Solutions. (2017). *Green-e renewable energy standard for Canada and the United States.* Version.3.1 Retrieved from https://www.green-e.org/docs/energy/Green-e%20Standard%20v3.1%20US.pdf

RE100. (2015). *The Journey to 100%*. Retrieved from http://media.virbcdn.com/files/d4/0d785368ea4e15c5-RE100briefing-reportre100websitev3.pdf

Sustainable Purchasing Leadership Council. (2016). Principles for leadership in sustainable purchasing, v 2.0. Retrieved from https://www.sustainablepurchasing. org/public/SPLC Principles for Leadership in Sustainable Purchasing v1 0.pdf

U.S. Environmental Protection Agency. (2017). Green power partnership requirements. Retrieved from https://www.epa.gov/sites/production/files/2016-01/documents/gpp partnership_reqs.pdf

Finding Green Power Products

Green-e. Find Green-e certified products and companies: http://www.green-e.org/certified-resources/products-companies

Making Appropriate Environmental Claims

Center for Resource Solutions. (2017). Renewable Energy Certificate (REC) Claims and Ownership. Retrieved from https://resource-solutions.org/learn/rec-claims-and-ownership/

RE100. (2016). *Making credible renewable electricity usage claims*. Retrieved from https://resource-solutions.org/

<u>document/making-credible-renewable-electricity-usage-claims/</u>

U.S. Environmental Protection Agency. (2017). *Guide to making claims about your solar power use*. Retrieved from https://www.epa.gov/sites/production/files/2017-09/

documents/gpp-guidelines-for-making-solar-claims.pd

U.S. Environmental Protection Agency. (2017). *Solar Power Use Claims Flow Chart*. Retrieved from_https://www.epa.gov/sites/production/files/2017-09/documents/gpp-solar-claims-flow-diagram.pdf

U.S. Federal Trade Commission. (2017). *Guides for the use of environmental marketing claims*. Retrieved from https://www.ftc.gov/sites/default/files/attachments/press-releases/ftc-issues-revised-green-guides/green-guides.pdf

Physical Power Purchase Agreements (Physical PPAs)

Cory, K., Canavan, B., and Koenig, R. (2009). *Power purchase agreement checklist for state and local governments.* National Renewable Energy Laboratory. Retrieved from. https://financere.nrel.gov/finance/content/power-purchase-

<u>agreement-checklist-state-and-local-governments</u>

Deloitte. (2016). Powering up the new leases standard. Retrieved from http://www.nortonrose-fulbright.com/knowledge/publications/157593/financing-projects-with-virtual-ppas

Federal Energy Management Program. Federal onsite renewable power purchase agreements: https://energy.gov/eere/femp/federal-site-renewable-power-purchase-agreements

Merry, L., and Wood, E. (2008). *The customer's guide to solar power purchase agreements*. The Rahus Institute. Retrieved from http://my.solarroadmap.com/userfiles/ PPA-Customers-Guide.pdf

National Renewable Energy Laboratory. NREL Finance Team Publications: https://financere.nrel.gov/finance/content/nrel-finance-team-publications

Solar Energy Industries Association. Solar power purchase agreements: https://www.seia.org/ research-resources/solar-power-purchase-agreements

Terms of service commercial 1.1. (n.d.) https://financere.nrel.gov/finance/content/terms-service-commercial-11

U.S. Environmental Protection Agency. Solar power purchase agreements: https://www.epa.gov/greenpower/solar-

power-purchase-agreements

World Bank Group. Power purchase agreements (PPAs) and energy purchase agreements (EPAs): <a href="http://ppp.worldbank.org/public-private-partnership/sector/energy/energy-energ

<u>power-agreements/power-purchase-agreements</u>

Financial PPAs (Virtual PPAs, Contracts for Differences)

Business Renewables Center: Tools and resources (available to members) http://businessrenewables.org/

Giji, M. John, Sachdev, R., Sherman, L., and Spielberg, D. (2016). Corporate PPAs: Market trends and opportunities. Orrick Herrington & Sutcliffe LLP. Retrieved from http://s3.amazonaws.com/cdn.orrick.com/files/Corporate-PPAs-Market-Trends-and-Opportunities.pdf

Gurch, M.J. (2017). Financing projects with virtual PPAs. Project Finance Newswire. (p. 14) Retrieved from. http://www.nortonrosefulbright.com/knowledge/publications/157593/financing-projects-with-virtual-ppas.

Mickelsen, S. (2016). Dodd-Frank compliance for corporate VPPA buyers. *Futures and Derivatives Law Report*. 36, 4. Retrieved from https://3degreesinc.com/wp-content/uploads/2016/05/GLFDLR4 Article-1.pdf

Turk, G. (2007). How market dynamics impact PPA, VPPA contracts. Smart Energy Decisions. Retrieved from https://www.smartenergydecisions.com/columns/2017/03/09/how-market-dynamics-im-pact-ppa-vppa-contracts

U.S. Environmental Protection Agency. (n.d.) Introduction to virtual power purchase agreements. https://www.epa.gov/sites/production/files/2016-09/documents/webinar_kent_20160928.pdf

Community Solar/Community Renewables

Interstate Renewable Energy Council. Shared renewables: http://www.irecusa.org/regulatory-reform/shared-

<u>renewables/</u>

National Renewable Energy Laboratory. Solar technical assistance for states: https://www.nrel.gov/technical-assistance/states.html

National Renewable Energy Laboratory. (2010). *A guide to community shared solar: Utility, private and nonprofit project development.* Retrieved from http://www.nrel.gov/docs/fy12osti/54570.pdf

National Renewable Energy Laboratory. (2014). *Community shared solar: Policy and regulatory considerations*. Retrieved from https://www.nrel.gov/docs/fy14osti/62367.pdf

National Renewable Energy Laboratory. (2015). Shared solar: Current landscape, market potential and the impact of federal securities regulation. Retrieved from https://www.nrel.gov/docs/fy15osti/63892.pdf

Rocky Mountain Institute. Shine: Community scale solar: https://www.rmi.org/our-work/electricity/shinecommunity-scale-solar/

Solar Energy Industries Association. Shared renewables/community solar: http://www.seia.org/policy/distribut-ed-solar/shared-renewablescommunity-solar

Writing RFPs for Green Power

National Renewable Energy Laboratory. (2016). Writing solar requests for proposals (RFPs): Lessons from NREL's university PV implementation assistance program. Retrieved from http://www.nrel.gov/docs/gen/fy16/66369.pdf

The World Resources Institute Green Power Market Development Group (n.d.). Guidelines for writing a REC request for proposal and sample contract for renewable energy certificates. Retrieved from www.thegreenpowergroup.org/tools.cfm?loc=us

The Solar Foundation. (2012). Steps to a successful solar request for proposal. Retrieved from https://www.thesolarfoundation.org/steps-to-a-successful-solar-request-for-proposal/

U.S. Environmental Protection Agency. Toolbox for renewable energy project development: https://www.epa.gov/repowertoolbox

Self-generation (On-site)

Bolinger, M. (2009). Financing non-residential photo-voltaic projects: options and implications. Lawrence Berkeley National Laboratory. Retrieved from https://jointventure.org/images/stories/pdf/lbnl.financing. pv.pdf

California Energy Commission. (2001). A *guide to photo-voltaic (PV) system design and installation*. http://www.energy.ca.gov/reports/2001-09-04_500-01-020.PDF

California Energy Commission. (2003). *Buying a photovoltaic solar electric system: A consumer guide.*Retrieved from http://abcsolar.com/pdf/2003-03-11_500-03-014F.pdf

Hassett, T. C., and. Borgerson, K.L. (2009). *Harnessing nature's power: Deploying and financing on-site renewable energy.* World Resources Institute. Retrieved from http://pdf.wri.org/harnessing_natures_power.pdf

FEMP. (2002). *Using distributed energy resources:* A How-to guide for federal facility managers. U.S. Department of Energy. DOE/GO-102002-1520. Retrieved from http://smartenergy.illinois.edu/pdf/Archive/UsingDistributedEnergyResources.pdf

Gagnon, P., Govindarajan, A., Bird, L., Barbose, G., Darghouth, N., and Mills, A. (2017). Solar + storage synergies for managing commercial-customer demand charges. Lawrence Berkeley National Laboratory and the National Renewable Energy Laboratory. Retrieved from https://emp.lbl.gov/sites/default/files/solarstor-age_synergies_report.pdf and https://emp.lbl.gov/sites/default/files/solarstorage-execsummary.pdf.

Midwest region consumer's guide to buying a solar electric system. (n.d.). Retrieved from https://www.itasca-mantrap.com/sites/itascamantrap/files/PDF/Consumer_Guide_to_Solar_Systems_MNDOC.pdf

U.S. Department of Energy. (2007). Small wind electric systems: A U.S. consumer's guide. Retrieved from https://energy.gov/sites/prod/files/2013/12/f5/small_wind_guide.pdf

WINDExchange:

http://apps2.eere.energy.gov/wind/windexchange/

On-site Renewable Generation Financial Analysis Tools

Each of the many available tools offers different features, which should be examined closely to determine whether they are appropriate to the particular situation.

Carbon Value Analysis Tool

Developer: World Resources Institute.

A screening tool to help companies integrate the value of carbon dioxide emissions reductions into energy-related investment decisions: http://www.wri.org/
publication/carbon-value-analysis-tool-cvat

PV Watts

Developer: NREL

Provides estimated system output and savings calculations based on customizable system specifications and in the field system performance data. User inputs system information and selects a system in the general area of the user's own site to provide calculations: http://pvwatts.nrel.gov/

RETFinance

Developer: Energy Analysis Team at NREL Simulates a 30-year nominal dollar cash flow for renewable projects, including earnings, debt payments, levelized cost-of-electricity, after-tax internal rate of return and debt service coverage ratio (net operating income divided by total debt service): https://

<u>cleanenergysolutions.org/resources/renewable-energy-technologies-financial-model-ret-finance</u>

RETscreen International:

Developer: Natural Resources Canadas CANMET Energy Diversification Research Laboratory (CEDRL). Assesses the economics of various renewable energy installations: www.retscreen.net

Interconnection with the Grid

DSIRE database lists state interconnection rules: www.dsireusa.org/

The Federal Energy Regulatory Commission (FERC) has issued standard procedures and a standard interconnection agreement for the interconnection of generators to the transmission grid. The rules differ depending on whether the generator is larger or smaller than 20 megawatts. This site lists the applicable rules: https://www.ferc.gov/industries/electric/indus-act/gi/small-gen.asp

Standards Board of the Institute for Electrical and Electronics Engineers, Inc. (IEEE). (2015). *Standard 1547: Standard for interconnecting distributed resources with electric power systems*: http://grouper.ieee.org/groups/scc21/1547/1547 index.html

Varnado, L., and Sheehan, M. (2009). *A guide to distributed generation interconnection issues*, Sixth Edition. N.C. Solar Center and Interstate Renewable Energy Council. Retrieved from http://www.irecusa.org/wp-content/uploads/2014/11/Connecting-to-the-Grid-Guide-6th-edition1.pdf

Measurement and Verification of Renewable System Performance

The regional tracking systems' operating procedures specify how generators must measure, verify and report generation to be issued certificates. See links under Tracking Systems.

Cory, K., Coughlin, J., and Coggeshall, C. (2008). *Solar photovoltaic financing: Deployment on public property by state and local governments.* National Renewable Energy Laboratory. NREL/ TP-670-43115. Retrieved from

http://www.nrel.gov/docs/fy08osti/43115.pdf

U.S. Department of Energy, Federal Energy
Management Program. (2015). *M&V guidelines: Measurement and verification for performance-based contracts version 4.0.* Federal Energy Management
Program. Retrieved from https://energy.gov/sites/prod/files/2016/01/f28/mv_guide_4_0.pdf

Renewable Energy Certificates (RECs)

American Bar Association, American Council on Renewable Energy, and Environmental Markets Association. Master Renewable Energy Certificate Purchase and Sale Agreement: http://emahq.org/node/29

Center for Resource Solutions. (2016). How renewable energy certificates make a difference. Retrieved from https://resource-solutions.org/wp-content/uploads/2016/03/How-RECs-Make-a-Difference.pdf

EPA's Green Power Partnership. Renewable Energy Certificates: https://www.epa.gov/greenpower/ renewable-energy-certificates-recs

EPA's Green Power Partnership. (2017) *Renewable Energy Certificate (REC) Arbitrage*. Retrieved from https://www.epa.gov/greenpower/renewable-energy-certificate-rec-arbitrage

Hamrin, J., and Wingate, M. (2006). *Regulator's hand-book on tradable renewable certificates*. Center for Resource Solutions. Retrieved from http://regulation-bodyofknowledge.org/wp-content/uploads/2013/04/ Hamrin Regulators Handbook on.pdf

Jaineel, A., and Lau, C. (2008). *Bottom line on renewable energy certificates*. World Resources Institute. Retrieved from http://www.wri.org/sites/default/files/pdf/bottom_line_renewable_energy_certs.pdf

Jones, T., Quarrier, R., and Kelty, M. (2015). Center for Resource Solutions. *The legal basis for renewable energy certificates*. Retrieved from https://resource-solutions.org/wp-content/uploads/2015/07/The-Legal-Basis-for-RECs.pdf

Renewable Energy Tracking Systems

APX: https://apx.com/registries/nar/

Electric Reliability Council of Texas (ERCOT): www. ercot.com: www.texasrenewables.com/

International REC Standard (I-REC Standard): http://www.internationalrec.org/

Michigan Renewable Energy Certification System (MIRECS): http://www.mirecs.org/

Midwest Renewable Energy Tracking System (M-RETS): www.mrets.org

New England Power Pool Generation Information System (NEPOOL GIS): www.nepoolgis.com/

New York Generation Attribute Tracking System (NYGATS): https://www.nyserda.ny.gov/nygats

North American Renewables Registry (NAR): www.narecs.com

North Carolina Energy Tracking System (NC-RETS): http://www.ncrets.org/

PJM Generation Attribute Tracking System (GATS): https://www.pjm-eis.com

U.S. Environmental Protection Agency. Green Power Partnership renewable energy tracking systems: https://www.epa.gov/greenpower/renewable-energy-tracking-systems

Western Renewable Energy Generation Information System (WREGIS): www.wregis.org/

Renewable Energy Associations

American Council on Renewable Energy: www.acore.org

American Solar Energy Society: www.ases.org

American Wind Energy Association: www.awea.org

Geothermal Energy Association: www.geo-energy.org

Geothermal Resources Council: www.geothermal.org

Interstate Renewable Energy Council: www.irecusa.org

Low Impact Hydropower Institute: <u>www.lowimpacthy-</u>dro.org

Midwest Renewable Energy Association: https://www.midwestrenew.org/

National Hydropower Association: http://www.hydro.org/

National Wind Coordinating Collaborative: www.nationalwind.org

North Carolina Clean Energy Technology: https://nccleantech.ncsu.edu/

Northeast Sustainable Energy Association: <u>www.nesea.</u> org

Renewable Energy Markets Association: www.renewablemarketers.org

Smart Electric Power Alliance: www.sepapower.org

Solar Energy Industries Association: www.seia.org

Utility Variable Integration Group: www.uvig.org

Windustry: http://www.windustry.org/

Greenhouse Gas Accounting and Inventories:

California Energy Commission. California climate change: www.climatechange.ca.gov/

CDP (formerly Carbon Disclosure Project): www.cdp.net

Center for Resource Solutions (2016). The greenhouse gas benefits of renewable energy purchases. Retrieved from https://resource-solutions.org/wp-content/uploads/2016/11/GHG-Benefits-of-RE-Purchases.pdf

The Climate Registry: www.theclimateregistry.org

Greenhouse Gas Protocol. (2004). A corporate accounting and reporting standard. Retrieved from http://www.ghgprotocol.org/corporate-standard

Greenhouse Gas Protocol. (2015). Scope 2 guidance. Retrieved from

http://www.ghgprotocol.org/scope_2_guidance

Heilmayr, R. (2008). Bottom line on GHG emissions registries. Washington, DC: World Resources Institute. http://pdf.wri.org/bottom_line_ghg_emissions_registries.pdf

Metzger, E. (2008). Bottom line on climate policy terminology. World Resources Institute. Retrieved from http://www.wri.org/publication/bottom-line-climate-policy-terminology

The Regional Greenhouse Gas Initiative: www.rggi.org/rggi

U.S. Environmental Protection Agency, Center for Corporate Climate Leadership: https://www.epa.gov/climateleadership

World Resources Institute Carbon Value Analysis Tool: www.wri.org/publication/carbon-value-analysis-tool

World Wildlife Fund's (WWF) Climate Savers: https://www.worldwildlife.org/partnerships/climate-savers