

JUNE 2025





Acknowledgements

CRS would like to thank the members of the Working Group for this CEAP initiative. Their expertise and perspectives were critical to this initiative's objectives and outcomes.

- Kerri Metz and Markus Walther, Clean Energy Buyers Alliance
- Eric O'Shaughnessy, Clean Kilowatts
- Joseph Greene, Constellation
- Chris Goldsberry,
 EDP Renewables North America
- Harry Singh, Goldman Sachs
- Megan Sutter, Google
- Chad Reed and Al Jacobs, HASI

- Abe Gausepohl, Meta
- Joan Hutchinson, Marathon Capital
- Drew Beyer, Rocky Mountain Institute
- Adrian Markocic, Silicon Ranch
- Susanne Fratzscher, Sol Systems
- Peter Mostow, Wilson Sonsini Goodrich & Rosati
- Andrew Light, World Resources Institute
- Ryan Meinke, WSP

CRS would like to thank the CEAP Advisory Committee for its support. Without it, CEAP's work—and this publication—would not be possible.

- 3Degrees
- Apple*
- Carbon Solutions Group
- CDP
- Clean Energy Buyers Institute

- Priority Power
- Steel Dynamics
- STX Consulting
- University of California Office of the President
- WSP

Constellation

*Denotes CEAP Founding Partner

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 or Advisory Committee members or their affiliated organizations.



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Executive Summary

Voluntary markets for clean electricity are critical for meeting economy-wide climate goals. In addition to increasing overall demand and market participation, individual voluntary purchasing that directly impacts or has an increased indirect impact on the supply of clean electricity amplifies the effectiveness of the voluntary market for a quicker transition to a clean energy future.

This guidance can help voluntary buyers of clean electricity in the United States maximize their impact on expanding and maintaining clean energy supply. By aligning procurement practices with clearly defined indicators of impact, voluntary buyers can play a pivotal role in supporting new clean energy projects, sustaining existing infrastructure, and driving innovation across the energy sector.

This guidance describes 14 indicators of impactful clean energy procurement in three categories. For all indicators, procurement includes renewable energy certificates (RECs) or energy attribute certificates (EACs) that are surplus to regulation. For most indicators, procurement is from projects not older than 15 years. These indicators provide voluntary buyers with a flexible ex ante framework to increase the impact of their procurement on clean electricity expansion, supporting a diverse and resilient electricity market in the United States.

Indicators of Impact on New Clean Energy

- Long-Term Contracts (10+ years): Secure, ongoing support for new projects.
- 2. Early Commitments: Agreements entered into before project operations boost development.
- Financial Contribution: Procurement that provides revenue covering significant project costs.
- Direct Investment: Equity or financing that directly supports project viability.

Indicators of Impact on Maintenance of Existing Clean Energy

- 5. Financial Support to Prevent Closure: Financing that prevents closure sustains current clean energy supply.
- 6. Financial Support to Enable Repowering: Financing to replace equipment enhances the efficiency and longevity of clean energy generation.

Indicators of Indirect Impact on New or Existing Clean Energy

- 7. Innovative Transactions: New transaction structures that serve as model for others.
- 8. Increased Market Access: Contracts that enable diverse buyers expand demand.
- 9. New Market Infrastructure: Tracking and other infrastructure boost transparency and trust.
- Dispatchable Renewables and Paired Storage: Demand to support reliability and address net peak demand.
- **11. Collaborative Siting:** Partnerships streamline permitting and reduce delays.
- 12. Support for Emerging Technologies: Procurement that drives adoption of new technologies.
- **13. Transmission Expansion:** Investments in transmission support more clean energy projects.
- **14. Time-matching:** A strategy to sharpen market signals for new clean generation and storage.



Introduction

Voluntary buyers of clean and renewable electricity are increasingly focused on maximizing the impact of their purchases, aiming to meaningfully support new clean energy development. Recognition programs and reporting standards also seek to reward procurement decisions that drive new clean energy and grid decarbonization. However, the lack of consensus on which procurement decisions most effectively drive new clean supply has created challenges. It has led to reliance on generalized information and assumptions about impact and simplified purchasing options, fragmentation and disagreement among market participants, and uncertainty regarding investment—hindering market growth and collective progress toward clean energy goals. This guidance addresses the question: What are credible indicators of impactful clean electricity procurement? By identifying purchases that directly advance or have an increased indirect impact on new clean energy development and the maintenance of existing clean energy upfront, this guidance aims to assist voluntary buyers, standard setters, and recognition programs in the United States in achieving greater impact.¹ The goal is to foster alignment and clarity, enabling collective action to accelerate the transition to a clean energy future.



1 While the indicators are intended to support ex ante assessment of impact prior to procurement, certain indicators may require verification or documentation after procurement. This does not necessarily constitute ex post evaluation or verification of impact in those cases, but rather ex post verification that the indicator itself has been satisfied.



Definitions

Indicators, Not Metrics: Existing research and the expertise of a Working Group² of experts were used to identify key aspects of clean electricity procurement that tend to drive additional supply. Indicators were developed as observable or measurable proxies for the impact on new supply or as procurement with qualities that can be reliably correlated with changes in supply. This guidance is not intended to quantify the amount of new generation or capacity resulting, directly or indirectly, from individual purchases.

Definition of Impact: Impact is narrowly defined as direct and increased indirect effect on creating new or preserving existing clean electricity supply. Other environmental and social impacts were considered to the extent that they affect clean energy supply. A different definition of impact would yield different indicators. In particular, while reducing greenhouse gas emissions is a key driver of clean energy demand, indicators related to grid emissions were not included if the procurement does not directly support or have an increased indirect effect on new or existing clean energy supply.

Assumptions

Any Clean Energy: Indicators in this guidance are focused on procurement that drives any new clean energy supply or maintains any existing clean energy supply, without specifying the type of supply or its specific environmental or regional benefits, assuming any new clean energy contributes positively overall.

Long-term Impact Included: Indicators in this guidance are focused on procurement that drives new or maintains existing clean energy supply over any timeframe, acknowledging that development cycles vary, and developers often make market decisions years in advance based on anticipated demand and investment factors.

Limitations

Impact of Individual Procurements: Indicators in this guidance are focused on the impact of individual purchases, defined as the effect of a specific purchasing decision on clean electricity supply. This is distinct from market impact, which relates to the effect of aggregated demand on supply or the electricity system.

Impact Baseline is Active and Voluntary Purchasing:

Impact generally starts with active purchasing of clean energy that is not required by law or included in a standard offering from new facilities. For all indicators in this guidance, procurement includes RECs, or EACs for nonrenewable resources, that are surplus to regulation. With limited exceptions, procurement is also from projects not older than 15 years.³

U.S. Focus: Indicators in this guidance apply to procurement in the United States.

Practical Guidance: Although existing research was reviewed and used to develop this guidance (see Appendix B), no new studies or analyses were conducted to determine the empirical or modeled impact of different procurement options and deal structures on supply, perform an economic analysis of renewable energy markets, or analyze the price elasticity of supply or demand for clean energy.



² See Appendix C for a list of Working Group members.

³ Additional clarification is provided for indicators 1, 5, and 6 regarding the 15-year facility age limit.

Applicability

Indicators are relevant across regions and

procurement options, acknowledging regional clean energy needs, but may not be equally applicable or available in all areas of the U.S.

Indicators are designed to apply to all buyer types,

recognizing that different buyers have varying access to projects and procurement options, without tailoring indicators to specific buyer categories. However, for small or residential buyers, access to these indicators may require procurement on behalf of buyers or partnerships with larger buyers.

Characteristics

Indicators are weighted equally and function independently, signaling impact individually without

needing to be combined. However, they may be related, and impact assurance rises with more indicators met.

Use and Implications

Indicators are not prerequisites for impact and should not be used to label non-conforming purchases as non-impactful. The list of indicators is not comprehensive; other actions may also drive impact.

All voluntary demand and actions are meaningful

within the voluntary clean and renewable energy market, which is essential for efficient and large-scale deployment. The existing voluntary market effectively drives renewable energy development because of its significant overall size and value, as well as the fact that voluntary demand cannot be easily replaced.

Both primary and secondary markets for clean energy generation and attributes are valuable for market growth and stability. Shorter-term, secondary market, and lower-priced transactions benefit the overall market and accelerate deployment.





1. Procurement contract or purchasing agreement that is 10 years or longer.

Long-term contracts directly with projects, for either bundled clean energy or unbundled RECs/EACs, often enable project financing and are one of the clearest ways to support new clean energy projects. Contracts include bundled power purchase agreements (PPAs), financial/virtual power purchase agreements (VPPAs), or other long-term REC/EAC offtake agreements. In general, the longer term the better for impact. Long-term contracts with projects older than 15 years indicate impactful procurement if the contract is executed at the start of project commercial operations and has a term length longer than 15 years.

2. Procurement commitment made or agreement entered into before project(s) has started commercial operations.

Purchasing commitments made earlier in the project development process tend to have a larger direct impact on project development. In general, the earlier the better for impact. But there was no consensus within the Working Group on a specific phase of development prior to commencement of commercial operations (commercial online date), e.g., study phase for interconnection, the notice to proceed and project construction.

3. Procurement from projects for which the discounted value of contracted RECs is greater than five percent of the total net present value of the project, or procurement that provides sufficient revenue to cover the difference between a project's expected revenues and a project's revenue requirements (i.e., "missing money").

This indicator measures the value of procurement relative to total value in two alternative ways. Discounted value is the current value of the future revenue expected from selling RECs/EACs. It should be noted that the discounted REC/EAC revenue as a percentage of total net present value (NPV) is significant for long-term investors in high-capex environments but may not reflect procurement impact in low-capex settings (e.g., with lower technology costs and supportive policies). Missing money may be more or less than 5% of NPV and may be evaluated in terms of dollars per megawatt-hour (\$/MWh) multiplied by the contract term, for example. This indicator (both alternatives) requires project-level financial data or documentation to verify.

4. Procurement that accompanies providing direct investment, equity, tax equity, or debt financing for a project.

Providing project financing, such as equity investment, tax equity arrangements, or debt financing, in addition to revenues generated through procurement agreements, represents a qualitative indicator of impact on new clean supply. This type of financial support directly contributes to the financial viability of projects. This indicator requires substantiating qualitative information and documentation from the project developer.





Indicators of Impact on Maintenance of Existing Clean Energy

5. Procurement that either allows the project owner to make a direct investment, or in which the offtaker provides direct investment or other financing to prevent project closure.

This and the following indicator represent qualitative measures of combined revenues needed to maintain existing supply. Preventing project closure or ensuring continued operation generally means that the investment or financing ensures the continued operation of a facility that would otherwise be shut down due to financial, regulatory, operational, infrastructure-related, or other factors. The 15-year facility age limit for impactful procurement under this guidance may not apply in this case since projects in danger of closing are often older than 15 years and it may nevertheless be impactful to prevent project closure in that case. This indicator requires substantiating qualitative and quantitative information and documentation from the project owner.

6. Procurement that either allows the project owner to make a direct investment, or in which the offtaker provides direct investment or other financing to "repower" a project.

Facility "repowering" means replacement of clean energy generation equipment such that at least 80% of the fair market value of the facility derives from new generation equipment installed as a part of repowering. The 15year facility age limit for impactful procurement can be assessed against the date of re-entry into commercial operations after repowering work is complete. Impact is increased and may also be considered to be impact on new clean energy supply if repowering increases overall project capacity, e.g., in the case that new generation equipment is superior to the original equipment. This indicator requires substantiating qualitative and quantitative information and documentation from the project owner.





Indicators of Increased Indirect Impact on New or Existing Clean Energy

7. Procurement through a novel transaction or product in the market that may be standardized or serve as a model for others.

This indicator recognizes the value of innovation, efficiency, and flexibility to reduce risks and increase options in terms of transactions and financing. It requires substantiating qualitative information and documentation from the buyer or seller.

8. Procurement that expands access to clean energy beyond the purchaser and/or creates purchasing opportunities or options for new and diverse buyers to participate.

This indicator recognizes the value of increased market participation and growth. It requires substantiating qualitative information and documentation from the buyer or seller.

9. Procurement that involves the creation of new tracking, certification, or other market infrastructure.

This indicator recognizes the value of market functionality and consumer confidence. New infrastructure may include entirely new systems and tools that increase transparency and trust related to clean electricity delivery and purchasing (e.g., tracking systems or mechanisms, certification standards and programs, databases) or improvements to existing systems and tools (e.g., adding new functionality) that increase transparency or provide new information to the market about purchases and projects. This indicator requires substantiating qualitative information and documentation from the buyer or seller.

10. Procurement from new dispatchable clean and renewable resources or resources paired with storage.

This indicator recognizes the indirect impact of addressing reliability, net peak demand, and rapid ramp-ups before the peak, which generally support grid integration of clean and renewable resources. Examples of dispatchable resources include certain hydropower and biomass, geothermal, concentrated solar power with thermal storage, and green-hydrogen fueled power plants.

11. Procurement through collaborative siting initiatives, partnerships with local governments or community groups to identify potential installation sites on existing infrastructure, streamline permitting, and/ or improve interconnection queues.

This indicator recognizes the value of reducing interconnection queues, streamlining permitting, and addressing other project barriers in general. Collaborative siting initiatives are specifically aimed at identifying suitable sites for clean projects and helping streamline permitting processes. Installation sites on existing infrastructure include rooftops and brownfields.

12. Procurement from a project featuring technology that is identified as both clean and emerging by a governmental or international agency or body.

This indicator recognizes impact on new clean energy technologies. Several national and international agencies maintain lists or databases that track novel or nascent clean technologies. Examples include:

• The U.S. Department of Energy's Advanced Research Projects Agency-Energy



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- The National Renewable Energy Laboratory's Annual Technology Baseline
- The International Energy Agency's Energy Technology Perspectives report and Clean Energy Technology Guide
- The International Renewable Energy Agency's Innovation and Technology Outlook or Renewable Cost Database

13. Procurement that accompanies investments in the grid that increase transmission capacity for other clean energy projects.

This indicator recognizes the value of transmission to the expansion of clean energy. Buyers can support new transmission through direct investment, joint venture partnerships, contract provisions for transmission expansion, multi-stakeholder transmission agreements, green transmission bonds or funds, or other mechanisms. Buyers can also support the expansion of transmission availability (e.g., capacity on existing lines) through investments in smart grid technology or providing a project location that frees up transmission for other clean energy. This indicator requires substantiating qualitative information and documentation from the buyer or seller.

14. Procurement of generation that is timematched to load (e.g., on an hourly basis)

This indicator recognizes that hourly matching can have an increased indirect impact on the development of new clean energy by linking procurement to hourly supply conditions. Creating demand in specific hours where supply is scarce can incentivize new clean generation or storage to fill gaps in supply. The impact of hourly matching is particularly strong when applied to significant incremental load, such as new data centers, electrolytic hydrogen production, fleet electrification, or industrial expansion, as this increases overall demand and amplifies hourly scarcity, further incentivizing new supply. Hourly matching for existing load can also contribute to increased scarcity in constrained hours, potentially leading to similar market responses depending on market conditions.

To ensure impact, hourly procurement must be from new clean energy facilities, and hourly matching will only have increased indirect impact in hours where there is not already sufficient existing clean energy generation to meet demand. Otherwise, procurement shifts do not create new investment signals. The extent of impact also depends on overall hourly demand and participation rates, regional load aggregation, changes in demand over time, accuracy of foresight in hourly matching, transmission constraints, availability of different generation technologies, availability of standardized procurement options, and policy support and other incentives.



Key Takeaways

Indicators in this guidance serve as actionable ex ante guidelines for voluntary clean energy buyers aiming to increase their individual impact on clean electricity supply. The indicators apply across regions, procurement options, and buyer types in the United States.

There are 14 total indicators in three categories:

- Impact on New Clean Energy: Includes long-term contracts, early-stage commitments, significant financial contribution, and direct investments.
- Impact on Maintaining Clean Energy: Covers contracts or financing aimed at repowering or preventing closures.
- Increased Indirect Impact on New or Existing Clean Energy: Focuses on novel transactions, expanding market access, establishing market infrastructure, and enhancing grid reliability.

Other indicators that were considered and dismissed due to insufficient linkage to impactful outcomes are included in Appendix A. Resources used in the development of the indicators are included in Appendix B.

Future Work

Expansion and improvement of indicators of impactful clean energy procurement could include:

- Increasing Specificity: Providing guidelines for applying the indicators across various project types, locations, and market conditions to enhance relevance.
- Enhancing Verifiability: Introducing metrics or benchmarks for more standardized assessment, e.g., for indicators related to innovative transactions and market access expansion.
- **Developing Verification Requirements:** Adding data and documentation requirements to substantiate claims related to the indicators.
- **Providing Contextual Adjustments:** Adapting indicators to reflect regional differences in clean energy needs and market structures, ensuring tailored and meaningful impact.
- Developing Indicators of Other Impacts: Identifying indicators of impact on grid greenhouse gas emissions reductions or community benefits.





Appendix A: Dismissed Indicators

Many other potential indicators were discussed but not included for one of several reasons, including that they were out of scope (see Scope and Limitations above), captured by other indicators, or the relationship between the indicator and impact was not strong enough.

DISMISSED INDICATOR	EXPLANATION
Procurement using a certain type of product/option or form of contract (e.g., PPA, unbundled RECs/EACs, utility green tariffs, community solar, etc.).	There is too much variation in terms of impact within procurement type categories. The relation- ship between procurement category and impact is spurious, as it is actually driven by other specific characteristics of procurement (e.g., long-term purchasing).
Procurement where the price of renewable energy/RECs is above a certain threshold.	The direct impact of REC revenue is generally cap- tured in other indicators. The Working Group agreed that REC price is not the best proxy for impact, and that RECs, even at low prices, can be essential to a decision to invest in a project either as an owner or investor providing debt or other equity. Market prices generally help guide buyers to make efficient invest- ments that accelerate decarbonization. To recognize high-price options simply because of their high prices may be counterproductive to renewable energy deployment. Rather, other indicators recognize the value that RECs in aggregate are providing to the project (e.g., "missing money").
Procurement from projects that avoid grid emissions at lowest cost (low-cost marginal emissions impacts).	This is a different definition of impact related to grid emissions. We can identify relationships between pro- curement that drives new production and that which produces low-cost avoided emissions.
Procurement with flexibility for REC gaps or arbitrage.	This indicator is too broad. It requires identification of more specific features/conditions that create impact where RECs are monetized locally or arbitraged.
Large-scale procurement.	An indicator based entirely on purchase volume or project size would not be applicable to smaller buyers.



DISMISSED INDICATOR	EXPLANATION
Procurement from projects that have passed proj- ect-based additionality tests.	Other indicators approximate financial addi- tionality. In addition, project-level additionality testing for non-offsets might not be desirable, and verification may not be possible given the categorical exclusion of US renewable electric- ity projects by offset verification programs.
Procurement through retail options for which new ded- icated resources are built based on actual or anticipated levels of participation.	While this indicator applies to procurement by smaller and residential buyers, it is too close to the selected definition of impact and relies too heavily on a subjec- tive evaluation from the seller or developer.
Procurement that provides a "derisked" revenue stream.	Certain procurement types, e.g., VPPAs, may reduce price risk for developers. But there may be other procurement tools that provide a derisked revenue stream as well. Risk may also be based on who the buyer is. Ultimately, this indicator is too broad and subjective and is generally captured by other indicators.
Procurement that affects the internal rate of return (IRR) for a project relative to the weighted average cost of capital (WACC).	All procurement may affect the IRR. In general, a proj- ect is profitable if its IRR is higher than the WACC. This indicator may reveal, for example, that procurement makes a non-zero difference to project development. But the intent behind this indicator, to reflect the financial importance of procurement, is better cap- tured by other indicators.
Procurement that provides revenue or investment that allows a project to meet a return on investment thresh- old or "hurdle rate" that could not otherwise be met.	Similarly aimed at reflecting the financial importance of procurement, this indicator again is captured by other indicators that are more objective and verifiable.
Procurement that helps overcome interconnection, siting, permitting, and/or other project barriers.	While procurement strategies can influence the suc- cess of projects by addressing project barriers, other indicators generally capture these strategies, such as long-term, pre-commercial online date purchasing, procurement with investment, and procurement through collaborative siting.



DISMISSED INDICATOR	EXPLANATION
Procurement contract or purchasing agreement with an existing project the term of which is longer than the expected operational lifetime of the project at the time of execution.	This indicator was proposed for impact on mainte- nance of existing clean energy. It was later replaced with indicators for procurement that either allows for direct investment or financing to prevent project closure or repower an existing project. This was viewed as a stronger indicator of impact and reliably maintaining clean energy supply than a contract that extends beyond an "expected operational lifetime." Also, we were able to find few examples of such con- tracts for only certain technologies and in those cases the relationship and direction of causation between the contract and project extension was not clear.
Procurement that affects the market price of clean energy or RECs.	This indicator is too unclear and difficult to measure. All demand can be understood to affect price. The extent to which it does depends on elasticity eval- uations, which have not been conducted for this initiative. Even in that case, it is unclear how to evalu- ate the indirect effect of each increment of demand and the relationship of that to the pace of overall proj- ect development. The intent to measure the indirect effect of an individual increment of demand is better captured by other indicators.
Procurement that is part of a long-term organizational commitment to clean energy or electricity-related emis- sions reductions.	While this indicator places procurement in the context of a broader and perhaps longer- term commitment to procurement, which is impactful, this indicator is too broad and doesn't do enough to identify an impactful purchase. Other indicators focus on the impact of individual purchases and project-specific commitments.
Primary procurement from projects (as opposed to sec- ondary market transactions).	Both primary and secondary market transactions play vital roles in clean energy development. While primary transactions directly support specific projects, sec- ondary transactions provide liquidity, price discovery, and flexibility that enhance the overall effectiveness and efficiency of the market. A distinction between primary and secondary markets in terms of impact is too categorical to make and this indicator could needlessly undermine secondary markets.



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DISMISSED INDICATOR

EXPLANATION

Procurement from renewable resources that consistently operate during periods of regional peak demand.

This indicator seeks to recognize indirect impact on new supply through grid benefits (e.g., reliability) during peak demand, assuming that is good overall for renewable energy. Different metrics to evaluate grid benefits include capacity factor, dispatchability, firmness, ancillary services, and effective load carrying capability. These metrics could be combined with periods of peak demand to approximate reliability during peaks. We also want renewables that generate during off-peak periods and that are stored and discharged during peaks. Other indicators regarding dispatchable resources and storage are simpler, better address the net peak and rapid ramp up before the peak, and have a stronger relationship to new renewable development.

Purchases from facilities built within the last year for which at least 50% of operating hours occur during daily or seasonal periods in which the percentage of renewables operating in the grid subregion is below average for the subregion.

Procurement from "local" projects or projects located within certain geographic proximity to the purchaser (e.g., same grid region, balancing authority area, defined area of "deliverability") within the larger electricity sector or market. Demand for renewables that operate during periods when there are fewer renewables operating may support clean energy development overall by addressing problems related to congestion and non-coincidence. Other indicators are simpler and have a more direct relationship to new clean energy development.

While procurement from local projects has local impact, the extent to which it has direct or increased indirect impact on new clean energy development overall or maintaining existing clean energy supply, all else being equal, depends on regional grid and market conditions. The potential benefits associated with locally focused demand must also be balanced against the benefits of larger (e.g., national) markets on overall clean energy deployment. Geographic flexibility (within a single market) has allowed for demand to support new clean supply where it is most cost-effective, helping scale development more quickly over a larger area and lower costs. It has also led to innovative and impactful procurement options, like VPPAs, which have played a significant part in new capacity additions recently. Narrower geographic matching (e.g., "deliverability" requirements) can directly impact new clean energy development where significant new load is being added, e.g., new electrolytic hydrogen production, and in combination with requirements for temporal matching and purchasing from new facilities (e.g., "incrementality").



Appendix B: Resources Reviewed

CRS reviewed key public resources related to the impact of various renewable purchasing options or approaches on new renewable supply. CRS prepared a summary of findings for the Working Group, which was discussed and used to inform the initial list of indicators and provide additional context.

ACORE. (2023). ACORE Statement on the Value of Renewable Energy Certificates. ACORE.

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