How States, Cities, and Customers Can Harness Competitive Markets to Meet Ambitious Carbon Goals

THROUGH A FORWARD MARKET FOR CLEAN ENERGY ATTRIBUTES

PREPARED FOR

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Notice

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Executive Summary

Across the U.S., over 100 cities and two states (Hawaii and California) plus the District of Columbia have already made the commitment to transition to 100% clean or renewable energy in the coming years.[1] In the past year, Xcel Energy became the first large utility to commit to 100% renewable energy, and the University of California system committed to 100% clean energy on a short timeline by 2025.[2] Nearly three-quarters of the Fortune 100 companies have adopted sustainability and renewable energy goals.[3]

Achieving these ambitious public and private goals will eventually require replacing much of the current fleet of generation that relies heavily on carbon-emitting coal and natural gas. But such an ambitious transition to clean energy is unlikely to happen on its own, and it is unlikely to be achieved cost-effectively using traditional policy instruments. What's needed now is to acknowledge that transitioning to 50% or 100% carbon-free energy will require some fundamentally different and better policy tools. In this whitepaper, we propose a new forward clean energy market (FCEM) in order to harness competition and innovation. The FCEM would provide a competitive, regional market for clean electricity attributes. It would enable states, cities, and customers to achieve their ambitious carbon targets at lower costs. Furthermore, it would complement existing competitive wholesale electricity markets.

The transition to clean energy is unlikely to happen on its own because, at least in restructured states, investment and operating decisions are driven by competitive market forces that do not account for the cost of carbon emissions. Thus the markets underprovide clean energy relative to states' carbon targets. This shortfall has led many states to intervene in the electricity markets to achieve their policy goals. One approach is to procure and subsidize certain non-emitting resources directly. Such an approach may appear expeditious but does not necessarily identify the lowest-cost solutions among the diverse and evolving set of possibilities. The lowest cost path to decarbonization will be discovered only through innovation and broad competition among all types of resources and industry players, and across locations with different natural solar and wind patterns. Only market-oriented approaches will do that. But how can markets incorporate environmental values and find the least-cost solution?

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1 Sierra Club, "100% Commitments in Cities, Counties, and States," 2018.

2 David Roberts, "For the first time, a major US utility has committed to 100% clean energy," December 14, 2018, published in Vox.

Robyn Schelenz, "UC makes bold commitment to 100 percent clean electricity," October 29, 2018, published by the University of California.

3 Advanced Energy Economy, "2016 Corporate Advance Energy Commitments," December 2016.

The classic economists' approach is to internalize emissions costs into markets by charging for emissions, through either taxes or cap-and-trade. Carbon pricing is considered the most efficient approach because it creates the broadest possible competition for abating carbon, not only from carbon-free sources, but also from efficient gas-fired generation that can displace higher-emitting coal generation. Carbon pricing is challenging to implement effectively, however, if applied to only a subset of states, cities, and customers that wish to decarbonize within a highly interconnected interstate market. The main challenge is that electricity production and associated emissions can shift or "leak" from the areas that price carbon to those that do not, unless complicated border adjustments are applied. For regions that are not able to implement carbon pricing, our proposed FCEM can efficiently guide the transformation to clean energy.

The FCEM proposal is built around two core ideas: the first is *competition*, which is critical for identifying the least-cost solutions to a problem this big and with such varied possible solutions; this proposal ensures broad competition across carbon-free energy sources (although it does not incorporate substitution of relatively low-emitting natural gas generation for higher-emitting coal generation, as a carbon price would). The second is *smart product design*, where the marketable product is a clean energy attribute credit (CEAC), which is a certificate for 1 MWh of *clean energy attributes*, not including the energy itself. A marketable product reflecting just the clean energy attributes perfectly complements existing wholesale electricity markets. This allows the combined markets to find the least cost combination of technologies to meet traditional system needs while decarbonizing the grid. Traditional system needs are already rewarded through existing wholesale markets (for energy, capacity, and ancillary services), while the policy requirement to decarbonize will be rewarded through the new market (for clean energy attributes). Together, the wholesale markets and the FCEM can ensure that both system reliability and decarbonization targets are achieved at the lowest possible cost.

The FCEM would be administered by a state agency, a multi-state organization, or even an independent system operator. States and cities could submit demand bids for CEACs, consistent with their clean energy goals. Companies or retail electricity suppliers that wish to procure additional clean energy to meet private customers' sustainability goals could also submit demand bids.

Supply offers could be submitted by any resources that are qualified as contributing to the state's clean energy objectives, which could include nuclear plants, renewable generation, and any other resource that does not directly emit carbon and thus helps displace emissions. The market would clear only the lowest-cost supply offers to meet demand, and establish a competitive clearing price at which all transactions settle.[4] Cleared offers would be paid that price for a delivery term of one year (for most resources) or for a multi-year period of approximately seven years (for new

[4] It is also be possible to establish technology-specific "carve outs" to ensure a minimum share of the procurements would achieved from nascent technologies that may be higher cost. For example, see the "targeted resources" provision described in a proposal by The Brattle Group and several coalition partners, "A Dynamic Clean Energy Market for New England," November 2017.

resources, in order to provide developers with sufficient long-term price certainty to support financing new projects).

To pursue a market-oriented, cost-reducing approach, a single state or group of states could collaborate to develop and implement the a clean energy market through an appropriate agency, possibly with a governance model similar to that used in the Regional Greenhouse Gas Initiative (RGGI). The proven success and low costs achieved through such a design would likely attract additional future participation from more producers, states, cities, and customers over time.

I. Why Use A Competitive Market Approach to Achieve Clean Electricity Goals?

The next years and decades will see massive investment in clean energy. Many states, cities, and corporations have pledged to meet most or all of their energy needs from non-emitting resources. This means not only replacing current emitting generation, but also building enough to electrify transportation, heating, and many industrial applications. Electrification is currently the most promising opportunity to cost-effectively decarbonize much of these sectors. The cost of this ambitious investment program could be very high. To minimize the cost, it will be essential to leverage competitive, market-based approaches.

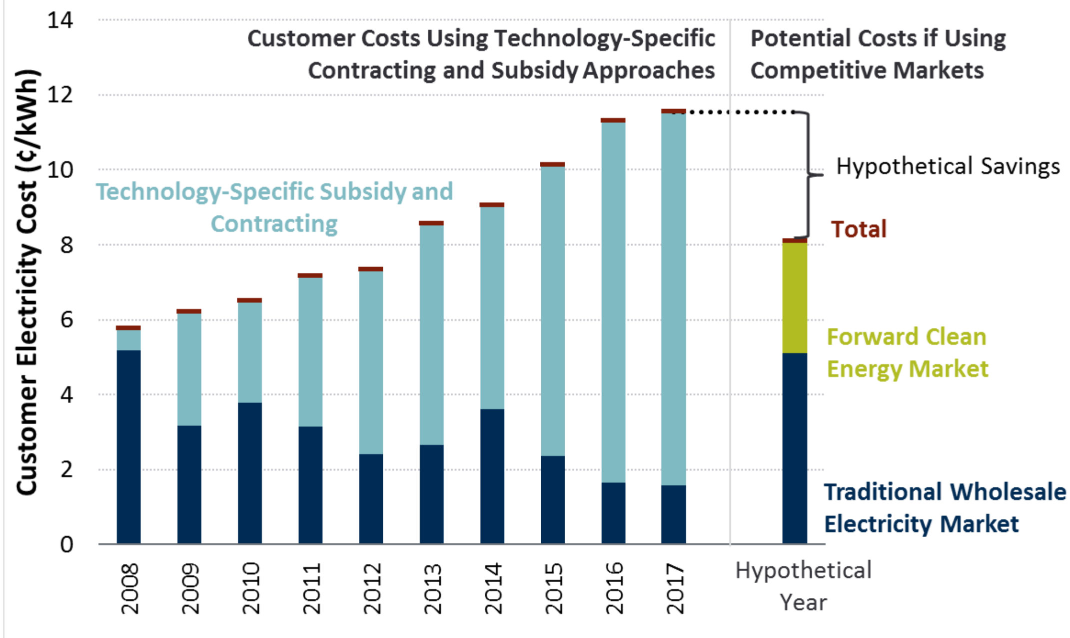
A. Traditional Approaches Will Become Too Costly if Scaled Up to Meet Policy Goals

Although traditional technology-specific subsidies and contracts have succeeded in driving clean energy investment in some jurisdictions, these approaches can be expensive, at are odds with existing wholesale electricity markets, and may transfer risks from producers to customers. In many places, total customer bill impacts have been modest so far, but only because the associated goals have been modest as well. The costs of current approaches could rapidly increase as aspirations for a low-carbon electricity system rise.

These concerns have already been borne out in other jurisdictions, where more ambitious objectives met through traditional policy approaches have often led to significant cost problems that have sometimes eventually triggered customer or policy backlash. For instance, over the last decade, the Ontario government signed 20-year contracts with many solar, wind, and other non-emitting resources as part of the overall goal to achieve its current 90 percent clean electricity grid. However, this momentous achievement has come at a high cost: residents there have seen their electric bills nearly double since 2008 even as solar and wind prices have come down every year, as shown in Figure 1. This illustrates the additional costs that can be imposed if policymakers lock in too many inflexible contracts at high prices, even if they are expected to be the lowest-cost alternative at the time those resources are procured.

Looking forward, Ontario is pursuing the opportunity to save customers billions of dollars by transitioning away from their traditional technology-specific contracting approaches and toward a market-oriented, resource neutral market.[5] Figure 1 illustrates the costs reductions that could be achieved if Ontario were to use a set of unbundled, resource-neutral markets for maintaining the 90% clean energy fleet as well as for meeting traditional wholesale electricity market needs.

Figure 1
Ontario Electricity Customer Costs While Achieving a 90% Clean Energy System Compared to Illustrative Costs of Achieving 90% Clean Electricity via a Competitive Market



Sources and Notes:
Values represent wholesale commodity costs, excluding transmission and distribution. Historical traditional electricity market costs represent the weighted-average Ontario Energy price (dark blue), and the Global Adjustment (aqua), which includes resource-specific subsidy and contracting costs. Hypothetical future year costs if using a competitive clean energy market are adapted from a Brattle modeling assessment of the future Ontario market (not intended to reflect a "but-for" estimate of historical costs). Source: "The Future of Ontario's Electricity Markets: Preliminary Study Results," November 30, 2018. The Brattle Group.

B. Broad Competition will Minimize the Costs of Achieving Carbon Goals

Using a broad market-based approach will focus the industry's incentives toward meeting current and future carbon goals at the lowest possible cost to customers. A truly market-based approach will spur:

- Competition among different developers of the same technology type, who may be able to innovate on more cost-effective ways to design, manufacture, install, or operate assets;

[5] The Brattle Group, "The Future of Ontario's Electricity Market: A Benefits Case Assessment of the Market Renewal Project," April 20, 2017, prepared for Ontario Independent Electricity System Operator.

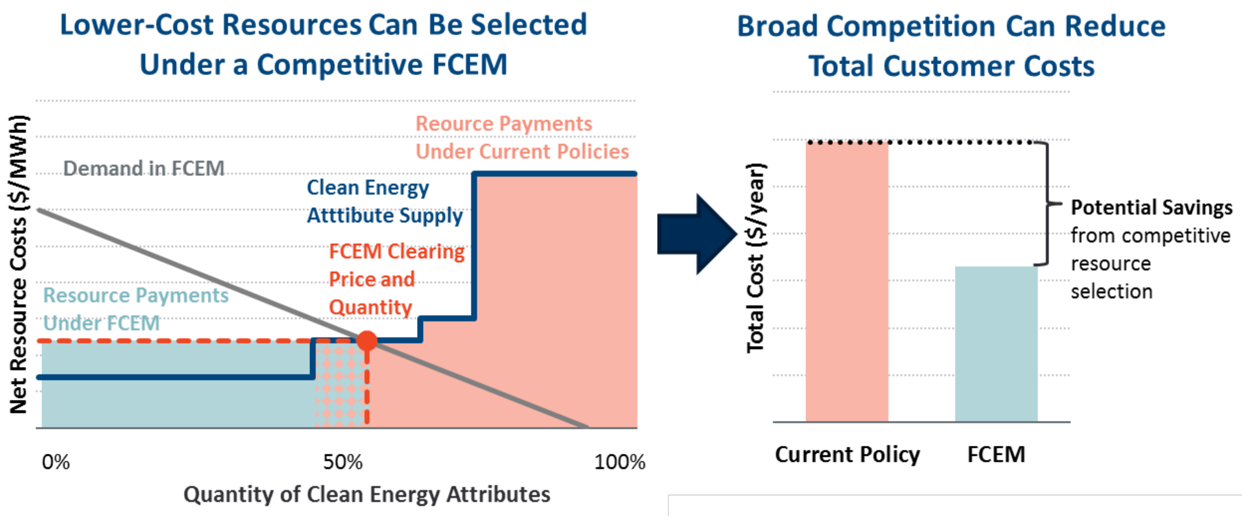
- Competition among different resource types with varying costs and operating characteristics (this is especially valuable as the cost of these technologies are rapidly changing and declining at differing rates);
- Competition among resources across disparate locations (because greenhouse gasses are global pollutants, the specific location of emissions—and the specific location of abatement—does not affect the value of carbon abatement);
- Competition between existing and new resources; and
- Competition among different clean energy resources that provide a variety of grid services, which are compensated via existing wholesale markets for energy, ancillary services, and capacity.

The cost-saving effects of resource-neutral competition are demonstrated in Figure 2, which compares the costs of achieving state clean energy goals if using a system of targeted subsidies (in red) to the costs if using a competitive FCEM (in blue). The left-hand side of Figure 2 shows illustrative costs of a variety of different resources and technologies that could be used to achieve carbon or clean energy goals, with resources sorted in order of increasing costs. The resources highlighted in red would be those selected under traditional policy approaches using technology-specific subsidies and bundled contract procurements. The resources developed under a suite of traditional policy approaches would likely support the development of both high-cost and low-cost clean resources, resulting in relatively high total costs (red bar on the right-hand chart).

The left-hand chart also illustrates the cost-savings that can be achieved with a competitive market. Under a resource-neutral FCEM auction, all sellers will offer in at the minimum price they need in order to develop a clean energy project.[6] The auction can then select only the lowest-cost resources regardless of technology, age, location, or other non-price attributes (resources highlighted in blue). This approach may result in procuring an entirely different mix of resources than would have been supported under traditional policy approaches, including some very low-cost resources that may not have been eligible to participate. As shown on the right-hand chart, the overall costs of such a program can therefore be much lower to achieve the same decarbonization goals (alternatively, the same program budgets can be used to achieve much more ambitious carbon reductions).

[6] This discussion assumes a uniform price auction format; pay-as-bid auction formats incentivize different (strategic) bidding behavior and may result in somewhat less efficient outcomes.

Figure 2
Competitive Markets Drive a Lower Cost Procurement of Clean Resources



This market-based approach can also greatly benefit (primarily corporate) customers wishing to privately exceed state-level targets. These individual customers can benefit from a centralized market platform that would help them purchase their desired clean energy resources at lower costs. This platform would enable private buyers to procure large or small quantities of clean electricity supply at a competitive price with minimal transactions costs, counterparty risks, and or other complexities that arise when contracting individually with developers. Developers, too, will benefit from a platform that offers a predictable opportunity to sell clean energy under standardized terms and under a level playing field. Thus, having a centralized competitive market can improve economic efficiency and lower costs by connecting suppliers with customers who want to set their own targets, goals, and commitments.

C. Technology-Neutral Approaches Maximize Efficiency and Reward Innovation

Another benefit of this proposed market is that it would allow competitive forces to identify the least-cost mix of resource technologies to reach carbon policy goals, and incentivize suppliers to find ways to deliver cleaner energy at lower prices. This market design rewards innovation in carbon abatement technologies and provides revenues for potential developers, new entrants, entrepreneurs, and existing generators alike as they seek to reduce carbon emissions. Competition across technologies avoids relying on policymakers to accurately predict the future of costs and innovation, or to pick "winners" and "losers." Instead, the market determines how the best mix changes over time to meet increasing decarbonization targets.[7]

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[7] As described in our prior work in New England, there are also variations of the FCEM that could introduce technology-specific carve-outs to support a preferred technology. Such a mechanism would

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For example, the most cost-effective mix of clean resources could evolve over time. At first, the lowest-cost existing supply might come from older nuclear and hydro resources that need refurbishment to continue operating. Next, high-quality wind resources could provide the lowest-cost clean energy. This may transition to solar resources as the best wind sites become saturated and peaking needs make consistent daytime production most important; this shift to solar would be incentivized based on the combined incentives of the FCEM and the unbundled value for other grid services. Finally, the most valuable technologies may transition to storage and demand response after intermittent supply displaces most fossil generation. Our proposed FCEM will facilitate and encourage this industry evolution. Continuing advances in unbundled energy, ancillary service, and capacity market designs will provide a strong complement to the FCEM to ensure appropriate incentives to avoid curtailments and incentivize flexible resources such as storage.[8]

The central benefit of this markets-based approach is that it incentivizes creative market participants to identify new solutions and technologies that policymakers cannot hope to think of. The ability to attract on that creative potential will be essential to meeting aggressive targets quickly and at low cost.

D. A Market Solution Can Better Align with Wholesale Electricity Markets

A market-based approach such as the FCEM has additional benefits beyond efficiency and cost-effectiveness. One key benefit is improved alignment with existing wholesale capacity, energy, and ancillary service markets. Most importantly, a marketable product reflecting just the non-emitting attributes of qualifying sources perfectly complements existing wholesale electricity markets for energy and reliability attributes. This allows the combined market forces to identify the least cost bundle of multi-attribute resources to meet multi-attribute system needs. This concept is grounded in a mechanism that has been proven to be effective: electricity generators already produce multiple marketable attributes, including energy, capacity, and various ancillary services products. The existing markets incent entities pursuing private profits to make investment and operating decisions that maximize the system value they provide across these multiple products. Adding a non-emitting resource attribute to the bundle of products that can be sold will

increase costs as compared to a fully resource-neutral approach. For more information, see The Brattle Group and several coalition partners, "A Dynamic Clean Energy Market for New England," November 2017.

8 Note that the full carbon abatement value of flexible resources including demand response and storage can also be incentivized under an FCEM on a resource-neutral basis with other clean technologies, but only if there is a mechanism for accurately tracking their carbon value (which traditional renewable energy credit markets have not previously done). For additional discussion of an FCEM approach that fully enables storage and demand response see The Brattle Group, "A Dynamic Clean Energy Market for New England," November 2017.

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incentivize all market participants to identify the best resources to jointly supply both traditional grid services and the demand for non-emitting supply.

One important issue in several electricity markets today is the "out-of-market" treatment of resources that receive payments for clean energy attributes. In ISO-NE and PJM, such resources are not allowed to directly participate in capacity markets without being subject to the so called "minimum offer price rules" (MOPR).[9] These rules limit the ability of resources receiving out-of-market clean attribute payments to offer and clear in the capacity market. This can result in two unsustainably detrimental outcomes from a state policy perspective: first, the resource adequacy value of these resources may not be fully reflected, leading to more capacity on the system than needed to meet reliability requirements; second, that customers that are paying for the "out-of-market" resources end up having to pay twice for capacity.

Our proposed approach is that clean resources receiving payments through the clean energy market should be considered "in-market" for purposes of interfacing with the wholesale capacity market, including for purposes of market power mitigation, such as the MOPR. Our design thus bridges the divide between state carbon goals and wholesale market reliability and least-cost planning criteria.[10]

II. What Would a Competitive Clean Attributes Market Look Like?

Our proposal centers on a regional forward auction for the clean attribute of electricity production, known as clean energy attribute credits (CEACs). In the most basic implementation of this approach as we describe on this paper, the clean attribute product would be similar to unbundled renewable energy credits (RECs) that are used to track renewable energy generation today. A REC represents the clean attribute of energy generation, and unbundled RECs are often sold separately from the original electricity production that generated it. Each REC is tied to a specific delivery year when it is generated. The CEAC product procured in the FCEM would have these same characteristics. Thus, the FCEM can be viewed as a natural successor to existing REC markets. However, the proposed market would incorporate several advantages over existing markets.

In the FCEM, state policymakers would mandate a quantity of carbon-free power that they wish to procure for all customers by a given delivery year. The state's mandated Clean Energy Standard

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9 For a more comprehensive discussion of this issue, see a recent discussion paper by Kathleen Spees, Johannes Pfeifenberger, Samuel Newell, Judy Chang, "Harmonizing Environmental Policies with Competitive Markets," July 2018.

10 The economic rationale for removing the MOPR on such competitively-procured clean energy resources is that a state non-emitting attribute program that is competitively administered and open to all qualifying resources on a non-discriminatory basis that satisfies the principles of competition underpinning the competitive wholesale electricity markets.

becomes the minimum quantity of carbon-free electricity, while allowing for easy and cost-effective over-achievement. At the state level, policymakers can express a desire to accelerate emissions reductions by utilizing this market design that procures more carbon-free power when prices are more attractive (but moderating goals in alignment with budget caps if prices are high).

The FCEM also creates a platform that allows private parties to buy additional carbon-free power. This allows companies, municipalities, public power entities, retail electric providers, and others to exceed the clean energy standard in a cost-effective manner and with minimal overhead costs. Each participant would translate its policy or corporate sustainability goals into a quantity of clean energy, and bid for this quantity in the FCEM. This allows states and customers to control their future and to procure the quantity clean energy resources that matches their policy goals to phase out fossil-fired carbon emitting resources over time.

On the supply side, generators who own or are developing resources that produce carbon-free electricity would offer to sell CEACs in the delivery year at a price they choose. The forward auction would set the quantity and price of the CEACs procured for the given delivery year.[11] By procuring carbon-free energy for a future year, the new market would incentivize investment in non-emitting resources. It would provide renewable developers access to a predictable source of revenues, including multi-year commitments for new resources that help to mitigate investor risk and reduce financing costs. Overall, this approach assigns regulatory risk to the states/customers, while leaving technology and cost risk primarily with market participants and investors, who are best able to manage that type of risk.

A. Translating Policy Goals into Market-Based Demand for Clean Electricity

For states that have policy commitments to serve a certain share of demand with clean resources such as through a Clean Energy Standard, these targets would be straightforward to translate into demand in the forward auction, as shown in Figure 3. In this example, the state currently has a small share of clean generation but has a target to meet 50% of demand with non-emitting supply by a certain year. Demand is forecasted to grow to 200 TWh by that future year, so the state target demand level for the clean energy attribute would be 100 TWh. Any willingness to procure more CEACs at low prices, or desire to procure less at high prices, would be represented through the specific shape of each states' demand curve for CEACs.

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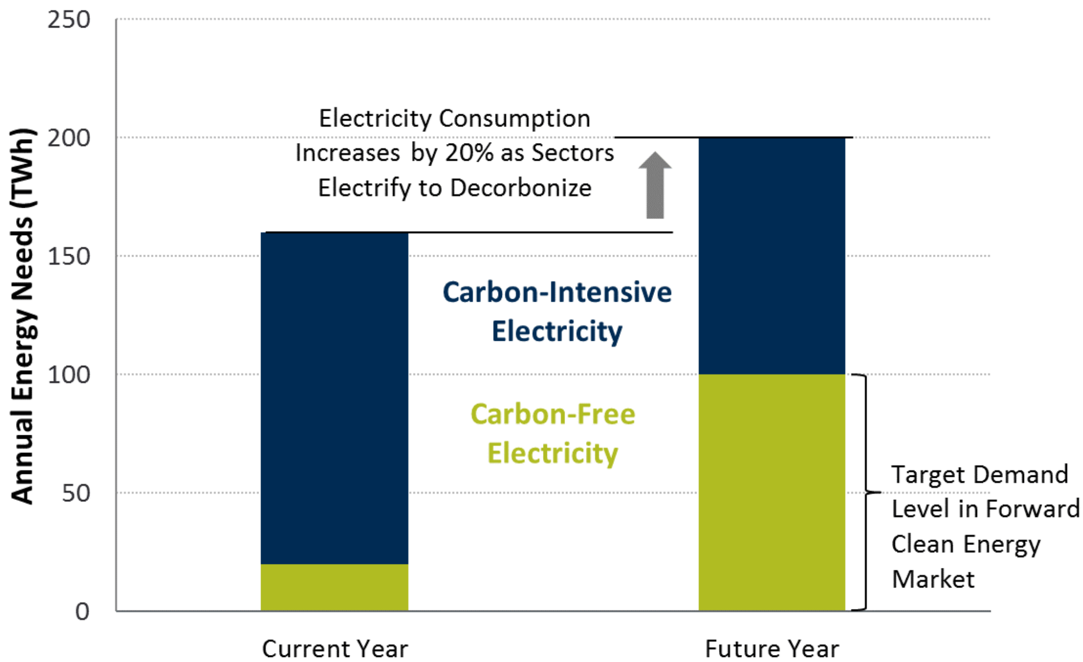
11 The delivery year is the period for which resources are committing to produce clean energy in the forward auction.

Figure 3
Example: Translating State Goals into Forward Clean Energy Market Demand



State-offered demand would also be submitted within the context of a commitment to sustained participation over many years in order to mitigate regulatory risks that may be introduced by uncertainties in the total auction demand levels over time. For example, states could be required to commit to a certain minimum demand for a ten-year period, with adjustments allowed as consistent with changes to total load.[12]

Cities, companies, public power, and retail providers might develop their own targets to meet internal sustainability or green energy goals or offer cleaner energy to their customers. These may be in excess of what the state will already procure on their behalf, or instead of it, if located in a state that is not participating in the auction. Thus, each potential market participant has full control of its level of demand for clean energy attributes. Each state or individual buyer would submit its demand for clean energy and the maximum willingness to pay for a specific quantity of CEACs.[13] The demand from each state and individual buyer would be summed into an aggregate market-wide market demand curve, representing to total quantity of CEACs desired by the market at each price, as illustrated in Figure 4.

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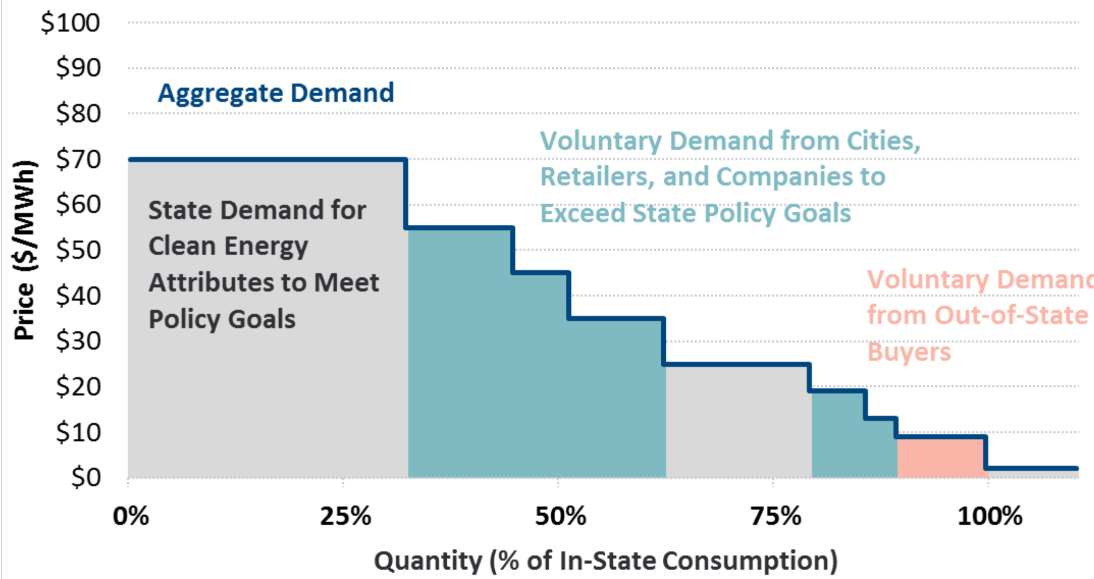
[12] Though states could commit to procuring that quantity in repeat auctions over the ten-year period, individual sellers would not be guaranteed ten-year contracts. Instead, sellers would have an opportunity to sell into the auction on a year-by-year basis, but would have to compete each year to sell at the lowest price.

[13] Buyers could also use more complex demand curves to represent their willingness to purchase CEACs as a function of price. This would allow them to represent higher willingness to purchase CEACs at low market prices if desired.

Figure 4
Aggregate Demand for Clean Energy Attribute Credits



Sources and Notes:
States could also choose to submit a smoothed downward-sloping demand curve (such as a cost-neutral curve that aligns with the program budget cap) but states' demand is shown in three blocks here for simplicity. Represented as the percentage of a specific state's demand, although the design will maximize benefits if extended to clear supply and demand from many states together.

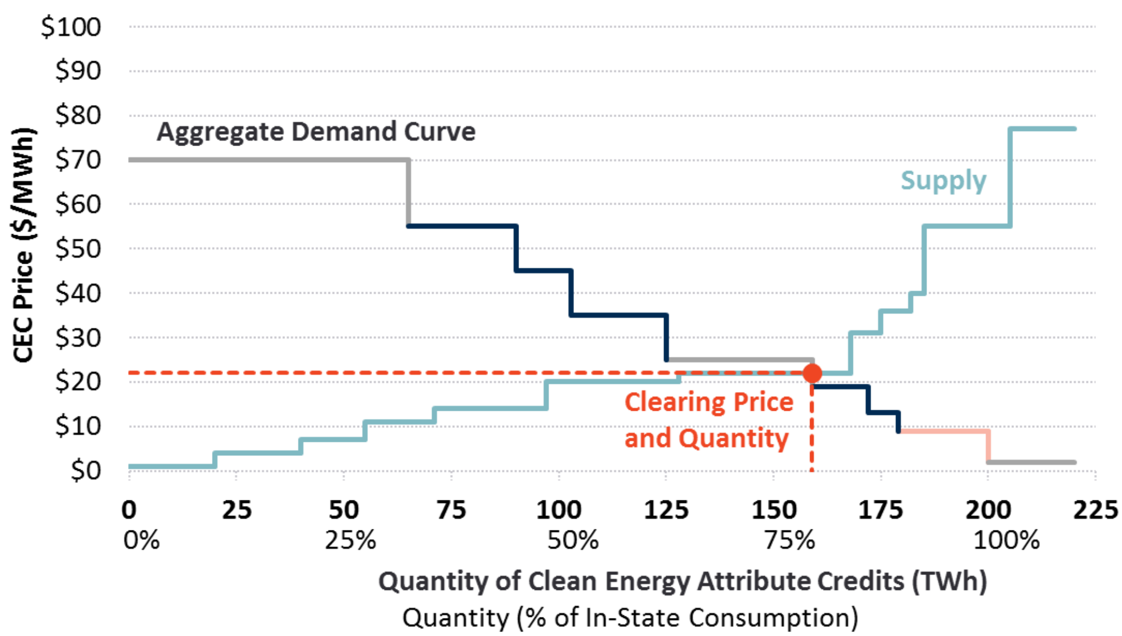
B. Procuring the Most Cost-Effective Clean Electricity in a Competitive Forward Market

A forward auction, which occurs three years in advance of the delivery period, would bring together market participants on the supply and demand side of the market. On the supply side, resources would offer in their estimated clean generation capability at a specified price for the delivery period. As the market is designed to be competitive, offer prices should reflect sellers' costs of clean generation, including going-forward costs of being online in the delivery year. Sellers whose resources are also valuable for providing energy, capacity, or ancillary services could offer at low prices into the FCEM because the large majority of the resource's costs will already be paid for by revenues from other wholesale electricity markets. The uniform-price auction would attract and reward the most cost-effective resources. More expensive options would not be selected.

On the demand side, states with mandatory targets for meeting clean electricity goals would make up the majority of bidders. For bids won by state entities, the costs and associated CEACs would be passed through to the retail providers within that state. Other participants including private companies, municipal utilities, electric cooperatives, and retail providers could submit voluntary bids to procure additional clean energy. These participants could use their cleared bids to meet corporate sustainability goals or to offer green energy rates to end use customers.

Aggregate market supply and demand would be cleared in a single-price auction as depicted in Figure 5. The resulting clearing price and quantity would be set at the intersection of these curves, and would determine which resources have an obligation to provide the clean attribute and how much they would be paid for it.

Figure 5
Example: Clearing the Forward Clean Energy Market



C. Features for Advancing Beyond Traditional Clean Attributes Products and Markets

While this proposed FCEM will be similar to existing REC markets as described above, it would also have several important features that will allow it to cost-effectively achieve far more carbon reductions at lower costs than traditional REC markets:

- **Technology-Neutral Participation:** unlike REC markets with tiered participation that segments different types of non-emitting resources and that tend to exclude some clean resource types like nuclear and resources existing prior to established cut-off dates, the FCEM would maximize participation of all non-emitting supply on a uniform basis.
- **Mechanisms to Support Price Stability:** a graduated demand curve for different quantities of CEACs at different prices in the forward market, and a spot auction conducted right before the compliance deadline would mitigate the boom or bust pricing tendencies of existing REC markets.
- **Capability to Support Financing of New Clean Energy Resources:** several design elements would support financing for new resources better than existing RECs, including a multi-year commitment for new resources and a forward auction to support financing of resources with longer development timeframes.

In addition, the proposed market would be flexible and easily tailored to integrate with other enhancements to advance beyond traditional clean energy products and markets. One potential drawback of the market as presented here is its focus on incentivizing non-emitting resources while admittedly not providing incentives for lowering the emissions through fuel switching from coal to gas generation as carbon pricing could.

In an even more efficient but somewhat more complex version of this market, the clean attribute product could be more directly tied to the marginal carbon abatement value of the resources in each year. Thus, resources that are expected to displace more carbon, due to the alignment of their generation profile with carbon emissions on the system, would create more CEACs. In the most advanced version of this approach, the quantity of CEACs created by a non-emitting resource could be dynamically related to the marginal rate of emissions in the market at every location in every real-time market interval. This would incentivize producers to identify opportunities to cost-effectively displace more carbon faster.[14]

III. A Potential Roadmap for Implementation

With sufficient political will, the proposal outlined in this paper could be implemented relatively quickly as a much-needed complement to the existing electricity markets (energy, ancillary services, and capacity). The initiative to create this market could be taken by a single state, a group of states, a group of clean energy buyers, or an RTO.

The market would work best if a state agency such as the Illinois Power Authority (IPA) or an independent organization with a structure such as RGGI or an RTO were to conduct the auction and manage the updating of market rules. If an independent group is chosen to administer the market, a new organization could be created or an existing company specialized in supporting the trade of commodity products could be contracted. If an RTO operates the market, the states could ask the RTO to create the auction and recover any administrative costs from market participants. The responsibilities of this organization would be to administer and update rules, register buyers and sellers, qualify supply, support measurement and tracking, maintain credit requirements, and implement settlements. A state regulatory body would likely maintain regulatory approvals and authority to change market rules, or as in the context of RGGI, the independent entity could develop model rules in collaboration with participants. These rules would then need to be separately ratified by each participating state authority.

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[14] The "standardized clean energy attribute credit" would represent 1 MWh of clean energy that displaces a certain quantity of carbon, for example 1,100 lbs of carbon per MWh. Resources would be credited with creating more CEACs if they inject clean energy into the grid at times and places that displace more carbon (and would produce fewer or no CEACs if injecting at times and places that do not displace fossil generation). For more discussion of this idea, see a proposal by The Brattle Group and several coalition partners, "A Dynamic Clean Energy Market for New England," November 2017.

Finally, state utility commissions or environmental agencies would develop state demand bids, in alignment with the commitments to achieve carbon abatement and maintain market sustainability. Large companies, cities, public power, retail providers, and other interested parties could also develop and submit voluntary demand bids.

The competitive marketplace is fit-for-purpose to identify and reward faster, cheaper, and better ways to decarbonize the electricity grid. When developed, the FCEM would allow states, retail providers, end customers, and clean energy suppliers to work in harmony to accomplish the ambitious goals before us.

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