ISO new england

memo

To: NEPOOL Participants Committee Working Session

From: Market Development

Date: March 11, 2021

Subject: Developing a Straw FCEM Framework

At the PC working session in February on Pathways to a Future Grid, stakeholders discussed a conceptual design specification for a Forward Clean Energy Market (FCEM) to be evaluated as part of the pathways efforts.[1] As part of this discussion, the ISO highlighted several design questions associated with this FCEM framework that would need to be addressed before this concept could be quantitatively studied.[2] In response, stakeholders requested that the ISO provide more guidance regarding potential approaches to address these "gaps" so that stakeholders could finalize the development of a straw FCEM framework that the ISO's consultants can model as part of the pathways analysis.

This memorandum seeks to be responsive to these stakeholder requests by outlining possible approaches to resolve many of the identified design questions. The outcome of this exercise is a framework that reflects but one of many potential design approaches for an FCEM, which is conducive to quantitative analysis. We look forward to hearing stakeholder comments and reactions, and expect that the straw framework will be updated to reflect an FCEM approach that can be studied by the ISO's consultants.

In some instances, the ISO puts forth an approach for the straw framework that we believe serves as a sensible starting point for the design. In other places, the ISO does not choose between design options, but provides observations on the potential approaches it has identified with the goal of facilitating productive discussions about stakeholders' preferred approach.

If the New England stakeholders ultimately were to consider market rule changes to introduce an FCEM, the pathways analysis may provide some guidance about potential design parameters and their expected outcomes. However, a process to further flesh out design details, more comprehensively assess

[1] The materials supporting this discussion include a written document (henceforth, referred to as the "stakeholder FCEM document"), available at https://nepool.com/wp-content/uploads/2021/02/FCEM-design-parameters-20-12-29.pdf, and a corresponding presentation, available at https://nepool.com/wp-content/uploads/2021/02/FCEM-for-NEPOOL-Pathways-210218-Rev1.pdf.

[2] See, for example, slides 15-19 of the ISO's presentation materials, available at https://nepool.com/wp-content/uploads/2021/02/ISO_New_England__Pathways_Kickoff_2-18-2021_final.pdf.

implementation questions, and draft market rules would still be needed and would involve significant additional time and effort. Such work is outside the scope of this phase of the pathways project.

Where the ISO did put forth specific design elements for consideration in the straw framework to help further stakeholders' interests, it used three criteria:

i. Generally choose design elements that are consistent with those put forth by proponents in their FCEM design materials to date;

ii. Choose the design options that more closely align with sound market design principles;

iii. Put forth an FCEM framework that is more conducive to quantitative modeling.

Observe that there may be instances where these criteria are not all in harmony. In such cases, the criteria may not offer clear guidance on how to model a design element thus requiring the ISO and stakeholders to consider the tradeoffs between these criteria when choosing a design approach.

The ISO anticipates that the modeling efforts undertaken as part of the pathways work will consider not only a straw framework, but also alternative design elements. Thus, even if a design feature is not included in the straw framework, this does not preclude its consideration for future evaluation, which may also be discussed with stakeholders and included in the final report associated with this phase of the project as time permits (this final report is expected by February 2022).

Importantly, this memorandum aims to help stakeholders move their FCEM concept forward into a framework that can be modeled as part of the pathways discussion. The content of this memorandum should not be taken as an ISO endorsement of such a concept or an indication that such an approach could be implemented. The results of the quantitative analysis, as well as a more comprehensive assessment of the feasibility of the straw FCEM framework, would be critical inputs to the ISO's ultimate opinion on such an approach.

We look forward to stakeholders' reactions to the ISO's views on potential straw framework elements, as put forth herein, and anticipate that this document will be updated during the pathways process to reflect stakeholder feedback and further ISO analysis.

1. Overview of straw FCEM framework

Table 1 below summarizes the key design elements that could be part of the straw FCEM framework. Column [a] specifies each of the design questions that is contemplated, and column [b] summarizes an approach for the straw FCEM design for stakeholder consideration. Column [c] notes the section in this memorandum that discusses this question in greater detail.

Table 1: Summary of Potential Straw Framework Elements			
	[a] Design Question	*[b]* Approach in Straw Framework	*[c]* Section
A. Who Receives Clean Energy Certificates?			
[1]	Technology types that receive clean energy certificates	Wind, Solar, Hydro, Nuclear	2.a
[2]	Does storage receive clean energy certificates?	To be determined with stakeholder input and further ISO evaluation.	2.b
[3]	Are energy certificates static or dynamic?	Static	2.c
[4]	Are there additional clean energy products?	No, there is only single product	2.d
B. Settlement			
[5]	What is the settlement structure for sellers?	Two settlement structure where supplier buys/sells certificates to true up to forward position	3.a
[6]	What is the non-compliance penalty rate?	To be determined with stakeholder input	3.b
[7]	Cost allocation for clean energy certificates bought forward	Allocated to RTLO in states that buy clean energy certificates forward	3.c
C. Interaction with existing programs			
[8]	How do clean energy certificates interact with existing state programs such as RECs	To be determined with stakeholder input. There are three possible paths: (i) clean energy certificates are separate from, and additive to, existing state programs; (ii) clean energy certificates include all environmental attributes; (iii) the FCEM replaces the existing state programs.	4
D. Integration with Forward Capacity Market			
[9]	Is the forward clean energy certificate procurement separate from or integrated with FCM?	Run a single auction that jointly procures capacity and clean energy certificates and specifies a separate price for each	5

As this table illustrates, the straw framework outlined in this memorandum specifies potential technologies for which resources receive clean energy certificates for their production (section 2). It also outlines a settlement structure for suppliers and a cost allocation methodology for consumers (section 3). It presumes that the FCEM and FCM are integrated, such that forward clean energy is procured jointly with forward capacity (section 5). We welcome stakeholder feedback on such design elements, including consideration of alternative approaches.

However, the table also notes that there are some design questions that remain outstanding, where the ISO's evaluation is ongoing or stakeholder feedback is requested. In particular, we continue to evaluate whether storage resources should receive clean energy certificates under a straw FCEM framework, and welcome stakeholder feedback on this topic (section 2.b). We also welcome stakeholder thoughts on a reasonable non-compliance penalty rate for clean energy certificates (section 3.b). Additionally, we invite stakeholder on how clean energy certificates would interact with the existing state environmental programs. The discussion identifies three potential paths: one where clean energy certificates do not directly interact with the existing state programs, a second where clean energy certificates include all environmental attributes, including those associated with existing state programs, and a third where the FCEM replaces these existing programs (section 4).

2. Determination of clean energy certificates

a. What technologies receive clean energy certificates?

A design consideration for a straw FCEM framework is that resources that generate electricity without any direct carbon emissions would receive clean energy certificates for their energy production. This approach is broadly consistent with that outlined in Section III.1 of the stakeholder FCEM document. Under such a definition, resources that are generally categorized as renewable energy resources, including wind and solar, could receive clean energy certificates for their production. Moreover, generation that comes from other technologies that do not emit carbon, including hydropower and nuclear, would also receive clean energy certificates.

This approach would not award clean energy certificates to generation technologies that emit carbon, such as natural gas, oil, and coal.

b. Treatment of storage

As noted above, resources that generate electricity without any direct carbon emissions would receive clean energy certificates for their energy production. However, this approach does not offer clear guidance regarding storage resources, which are different than other types of electricity supply. More specifically, storage resources charge when energy prices are low, and then discharge when energy prices are high. This act can help to increase clean energy production when the storage resource charges during a period where the marginal energy supply is clean, and discharges during a period when the marginal energy supplier is not clean.

Stakeholders have expressed an interest in ensuring that the design compensates storage resources for their contributions to clean energy production, with some supporting the position that energy supply from storage resources are awarded clean energy certificates. The ISO agrees that to be consistent with sound market design, storage resources should be compensated for their contributions to clean energy production. However, we continue to assess whether this objective is satisfied by awarding storage resources clean energy certificates, or if these resources are likely to be fully compensated for these contributions without receiving any clean energy certificates via increased energy market revenues.

We look forward to stakeholder feedback and continued discussion of the treatment of storage under a straw FCEM framework, and hope to share additional observations about how storage can be sensibly compensated for its contributions to clean energy at future stakeholder meetings.

c. Employing "fixed" rather than "dynamic" clean energy certificates simplifies design

At present, the straw FCEM framework described herein would award a certificate for each MWh of energy produced by a resource that can receive clean energy certificates for its energy production. We refer to this as a "fixed" certificate approach, as the quantity of certificates awarded for each MWh of clean energy produced is fixed across all hours of the delivery period. Alternately, stakeholders have raised the possibility of pursuing a dynamic approach, where the compensation for providing clean energy is weighted by the emissions rate associated with the marginal supplier.[3] The fixed approach appears to be

[3] For further discussion of this dynamic approach see slides 24 through 28 of the pathways presentation by Kathleen Spees from August 6, 2020, available at https://nepool.com/uploads/FGP_NPC_20200806_Spees.pdf.

simpler than a dynamic approach for purposes of modeling, and this factor informs the recommendation to use fixed certificates in the straw FCEM framework.

More specifically, there appear to be many outstanding questions with how a dynamic approach would work in practice. Importantly, a dynamic approach requires a methodology to determine the weights that correspond with marginal emissions. These weights can either be determined before the corresponding interval (ex-ante), or they can be calculated based on actual system conditions during the relevant interval (ex-post). Each approach introduces potential challenges for the modeling efforts, and possibly for clean energy suppliers making FCEM and energy offers.

An ex-ante approach raises numerous questions about how these weights would be estimated, including how granular they are with respect to time of day, season, day of week, and how frequently they are re-estimated. Consideration of such an approach could add significant complexity to the model. Moreover, if these weights were not known to sellers before the forward auction is run (3 years before the delivery period), they face a new form of risk associated with selling clean energy forward, as they must not only forecast their energy production during the delivery period, but they must also develop expectations about the applicable weights that would be used when they are generating. If their expectations of these weights are incorrect, they may fail to provide sufficient energy to meet their forward position.

An ex-post approach that determines weights using actual the actual marginal emissions rate introduces potential modeling challenges and raises a similar concern about suppliers' ability to forecast the weights when determining how much clean energy to sell forward. Moreover, it also introduces a new source of uncertainty for suppliers, as they must forecast the weights when bidding into the energy market, as these values will not be determined until the interval has occurred.

d. Consideration of additional clean energy products

A straw FCEM framework that only includes a single clean energy product may simplify the modeling process for several reasons, including that it limits the number of demand parameters that must be developed and modeled. Using a single clean energy product may therefore help facilitate the production of model results in a more timely manner than if the model straw framework allowed for multiple forward clean energy products to be procured.

Additionally, by only specifying a single product, the approach will foster greater competition between clean energy suppliers than if there were multiple products. This will help ensure that the straw framework will procure clean energy in a cost-effective manner.

3. Settlement and cost allocation

a. Settlement for energy suppliers

As the ISO has noted in numerous proceedings and projects, a forward market most sensibly settles against a corresponding spot market. Employing a two-settlement approach will create strong incentives for market participants to satisfy their forward positions in a cost-effective manner while helping to meet the region's clean energy goals. Consistent with this observation, the straw FCEM framework should include a "spot market" for clean energy certificates that allows suppliers to buy and sell clean energy

certificates if their production during the delivery period turns out to be higher or lower than what they sold forward.[4]

This approach would create strong incentives for resources to deliver clean energy (and thus, receive clean energy certificates) during the delivery period to meet the clean energy certificates that were sold forward. More specifically, resources that sold clean energy certificates forward would have a strong incentive to produce this clean energy during the delivery period to satisfy their positons. Moreover, resources that did not sell clean energy forward would also have strong incentives to produce clean energy as they could sell the certificates they created to participants that may otherwise not meet their forward positions.

The inclusion of a spot market for clean energy certificates would tend to reduce energy market offers from clean resources relative to current market rules. More specifically, resources that receive clean energy certificates for their spot market production would tend to lower their competitive energy offer price to reflect the fact that if they generate electricity, they receive a certificate that can then either be used to meet their forward position (thus preventing them from having to buy this certificate from another participant) or be sold.[5] In either case, the value of this certificate is equal to the price at which it could be sold. Thus, if the spot price at which certificates were sold is $10 per MWh, we would expect resources that produce clean energy to reduce their energy market offer price by $10 per MWh to reflect this value.

b. Non-compliance penalty rate

Under the proposed settlement structure, the design must specify a non-compliance penalty rate (presumably specified in dollars per MWh) that is applied to any clean energy certificate shortfalls, where the resource sells more certificates forward than it accumulates during the delivery period (either by producing clean energy or buying certificates from other resources).[6] Revenues associated with any non-compliance would be rebated to load.

A higher penalty rate will tend to reduce the likelihood that the region produces less clean energy than was procured forward, but it also is likely to increase clean energy certificate prices because resources must consider higher charges if they fail to procure sufficient certificates to meet their forward position.[7] Given its impact on clean energy certificate prices, and thus its close relationship with the specification for clean-energy demand, the ISO believes that the straw framework non-compliance penalty rate should be

[4] This spot market could resemble those currently in place for existing environmental certificates, where participants buy and sell certificates to satisfy their obligations (and therefore avoid non-compliance penalties). These transactions could be conducted bilaterally between market participants, or the ISO could take a more direct role in this process. However, for purposes of the straw framework, we do not believe it is necessary to determine whether the ISO has a role in administering this market.

[5] This same logic leads resources that receive RECs or production tax credits for their electricity to reduce their competitive energy market offer price to reflect the expected revenues associated with these credits.

[6] The need for this feature is noted in the stakeholder FCEM document in section III.3.

[7] Furthermore, this penalty rate acts as a price ceiling for the certificates, as participants would never pay more than this price to procure a certificate.

developed in close coordination with stakeholders and looks forward to continued discussion on this topic.

c. Cost allocation

In our understanding, the costs associated with the compensating energy suppliers for providing forward clean energy will be covered by new charges to consumers in states that buy this clean energy using a two-step process, where the approach outlined here seeks to build from that outlined in section I.4 of the stakeholder FCEM document. First, each state's total costs associated with this forward procurment are calculated as the product of the clean energy price and the quantity of clean energy awarded to that state, as determined by its accepted demand bid(s). Second, these costs are then allocated within each state on a pro-rata basis to Real-Time Load Obligation (RTLO) over the course of the delivery period.[8] This cost allocation methodology is illustrated via a simple numerical example.

Imagine that there are three states with different levels of load for the delivery period, and differing environmental goals that lead to varying levels of clean energy procurements. This is illustrated in Table 2 below, which considers these three states (column [a]) and for each, shows the total clean energy procurements for the commitment period (column [b]), and their total RTLO for the commitment period (column [c]). In this example, small state 1 serves the entirety of its 1,000 MWh of load via clean energy, large state 2 serves 1,500 MWh of its 3,000 MWh of load via clean energy, and medium state 3 does not serve any of its 2,000 MWh of load via clean energy.

Table 2: Clean Energy Procurements and Load

[a]	*[b]*	*[c]*
State	Clean Energy Procured *[MWh]*	Total RTLO *[MWh]*
State 1	1,000	1,000
State 2	1,500	3,000
State 3	0	2,000
Total	2,500	6,000

With these procurement and RTLO quantities established, we now consider how the costs associated with these forward clean energy procurements are distributed to consumers across the three states. We start with the first step, which determines the total costs borne by each state. These values are shown in column [d] of Table 3 (where columns [a] through [c] follow from those in Table 3). Because state 1 procures 1,000 MWh of the clean energy certificates, its consumers bear total costs of $10,000 (1,000 MWh × $10/MWh). Similar logic indicates that consumers in state 2 incur total costs of $15,000 for clean

[8] Whether these charges are administered by the ISO or another entity, the precise manner and frequency by which these charges are assessed, and the process to "true up" any deviations that occur if expected load differs from realized load would need to be determined for a fully developed proposal, but may not be critical for the purpose of modeling the straw framework.

energy certificates. Because state 3 does not procure any clean energy forward, it does not bear any incremental costs.

Table 3: Clean Energy Costs and Charge Rates

[a]	*[b]*	*[c]*	*[d]*	*[e]*
State	Clean Energy Procured *[MWh]*	Total RTLO *[MWh]*	Total Costs *[$]*	Charge Rate *[$/MWh]*
State 1	1,000	1,000	$10,000	$10
State 2	1,500	3,000	$15,000	$5
State 3	0	2,000	$0	$0
Total	2,500	6,000	$25,000	

For the second step, we calculate the charge rates to RTLO that states 1 and 2 apply to cover their respective forward clean energy costs. These values are given in column [e] of Table 3. When the $10,000 of costs in state 1 are distributed to its RTLO from the delivery period, this results in an additional cost of $10 for each MWh of energy consumed on top of the wholesale electricity price, thereby reflecting that a forward certificate is procured at a cost of $10 for every MWh of energy consumed. For consumers in state 2, the additional cost is instead $5 per MWh. This lower cost reflects the fact that only half of state 2's energy consumption is clean. Thus, the incremental charge associated with forward clean energy in state 2 is equal to half of the cost of a clean energy certificate.

4. Interaction with existing state programs (RECs, etc.)

Stakeholders have discussed several potential approaches on how the clean energy certificates could interact with existing state programs.[9] We discuss the three approaches that appear most sensible to consider for purposes of the pathways modeling efforts, where the first two broadly align with the two options discussed in section V of the stakeholder FCEM document.

Approach 1: Clean energy certificates reflect a clean attribute that does not overlap with other environmental attributes. Under this approach, a wind resource that qualifies under existing state renewable energy programs would receive both a clean energy certificate and a renewable energy certificate for each MWh of production.

Approach 2: Clean energy certificates encompass all environmental attributes. Under this approach, a wind resource that qualifies under existing state renewable energy programs and sells clean energy certificates would not receive renewable energy certificates for its production.

Approach 3: The existing programs are discontinued, and the region uses clean energy certificates to meet its environmental objectives. Under this approach, the wind resource is only awarded a clean energy certificate, as this is the only environmental attribute for which the region provides compensation.

[9] As the straw FCEM framework is developed, we may also consider how it accounts for existing long-term PPA contracts that have already been executed to meet state environmental objectives.

The first and third approaches are simpler in that they do not require consideration of direct interactions between the existing state programs and a new clean energy product. The second approach may raise questions about these interactions that would need to be considered further. These questions relate to how demand for the existing products is affected by the introduction clean energy certificates and whether a resource would ever forgo electing to receive a clean energy certificate to instead receive other environmental attributes.

We welcome stakeholder input on the preferred approach to this design element for the FCEM. Moreover, we believe it is prudent to pursue consistency between this framework and the net carbon pricing framework with respect to the assumption about whether the existing state programs persist. This would require that the modeling of both frameworks either assumes that i) the existing state programs remain or ii) they are eliminated. Such an approach will better allow for an apples-to-apples comparison of these frameworks and is more likely to facilitate productive evaluation of their relative outcomes merits.

5. Integration of the FCEM with the Forward Capacity Market

Stakeholders have expressed interest in exploring the feasibility of determining forward clean energy positions as part of a single joint optimization with the existing Forward Capacity Market (FCM) that simultaneously determines clearing awards and prices for both capacity and forward clean energy. Such a design is referred to as an Integrated Clean Capacity Market (ICCM) and may reduce the uncertainty that occurs under a sequential approach where participants do not know the awards or prices for the second product when determining offers for the first product.

As the ISO explains in its memo titled "Evaluation of an Integrated Forward Clean Energy Market," our analysis to date suggests that the joint clearing of capacity and clean energy in a single auction is theoretically feasible and thus we plan to model a straw framework where these products are procured jointly. This aligns with option 2 under section IV of the stakeholder FCEM document.

Under the approach outlined in the ISO's integrated FCEM memo, resources would submit a single price, much like under the current FCM. In addition to submitting a capacity quantity, they would also submit a clean energy parameter that reflects the MWh quantity of forward clean energy they would sell for each unit of capacity sold. The auction would determine capacity and clean energy awards to maximize social surplus and specify separate prices for each product.

While we believe that the ICCM is theoretically feasible and the concept put forth can be modeled as part of the pathways efforts, significant additional work would be necessary to evaluate the challenges that may come with translating this novel concept into a fully developed and economically sound auction framework.