CLF Carbon Integrated Forward Capacity Market (FCM-C)

- Complementary to carbon price in energy market
  - The carbon price will help reduce carbon emissions (as described in previous slides)
  - FCM-C creates additional market-based incentives for clean energy resources to be developed on a schedule consistent with 80% by 2050 goal
- Operates as a component of and simultaneous with FCA
- All suppliers bid in two quantities at a single combined price: (a) zero-emissions credits (ZECs) for zero-emitting resources (in MWh) and (b) traditional FCA capacity (in MW).
- ZEC is the "green" attribute of non-emitting resources:
  - Not bundled with energy value (additive to energy price payments)
  - Technology neutral, all non-emitting existing and new resources can produce ZECs

FCM-C Mechanics: Offer Structure

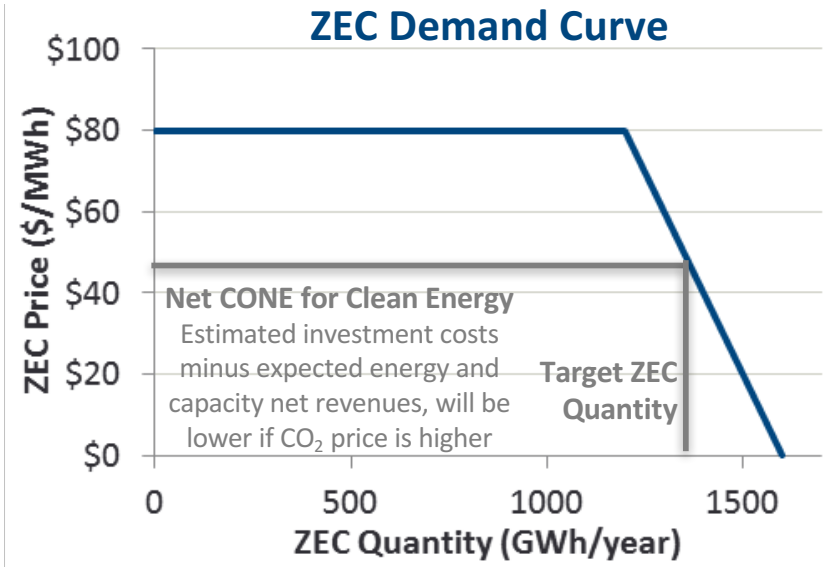
- **Offer Structure:**
  - Just as in today's FCM, resources bid a single price into the FCM-C in accordance with their revenue requirements. Offer price is in $ per nameplate MW.
  - The FCM-C recognizes this single-price bid as reflecting willingness to sell both: (1) a particular quantity of ZECs (offered in MWh) and (2) a particular quantity of traditional capacity (offered in MW). The seller should be indifferent to whether the payment comes from ZEC or capacity, as long as the total payment is equal or greater than the offer price

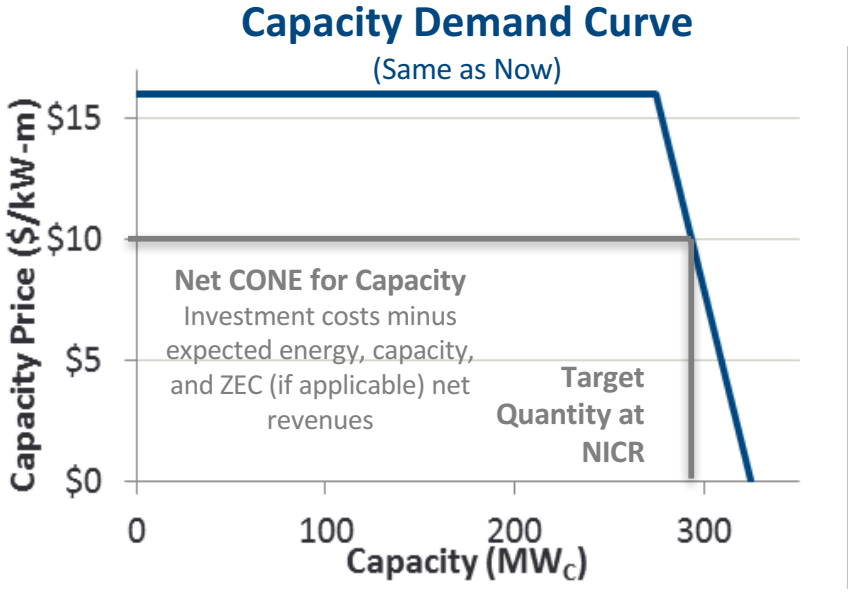
Example: Offers for Different Resource Types

		Nuke	Hydro	Gas CC	Wind
Resource Ratings					
Nameplate	*(MW_N)*	100	100	100	100
Capacity	*(MW_C)*	100	100	100	15
ZECs	*(GWh/year)*	788	438	0	263
Offer Price	*($/kW-$m_N$)*	$10	$10	$7	$10

FCM-C Mechanics: Demand Curves

- **Two Demand Curves:** (1) one for zero-emitting energy; (b) one for capacity, per current tariff
- **Capacity Demand Curve:** Same as now
- **ZEC Demand Curve:**
  - Quantity points on the ZEC demand curve are developed by ISO based on a projection developed in the CELT that determines the quantity of clean energy MWh needed, consistent with the CO_2 emissions trajectory determined by ISO-NE in consultation with state regulators
  - Price points on the ZEC demand curve are based on the "Net CONE" for the anticipated marginal non-emitting resource type. Price can fall to zero if clean energy resources are built based on the energy plus capacity prices, or can rise up to the price cap (e.g. at 1.6x the Marginal Clean Energy Resource's Net CONE) if the quantity is short





conservation law foundation

Notes: Straight-line curves shown for simplicity. No change is proposed to the current capacity demand curve shape.

FCM-C Mechanics

- **New Entry Price Lock-in:**
  - Same term of price guarantee (in both $/MWh for ZECs and $/kW-m for capacity) is offered to any new resources that clear in the auction (the same applies to traditional resources and non-emitting resources)

- **Impact on meeting NICR:**
  - Capacity value of non-emitting resources that clear in the FCM-C contribute toward meeting the NICR

FCM-C Mechanics: Joint Auction Clearing

- Capacity and clean energy needs will be jointly procured in a co-optimized fashion
- Benefits of joint procurement:
  - Minimize total capacity + ZEC procurement costs, reducing system and customer costs compared to non-integrated procurement
  - Enable suppliers to avoid risk of selling capacity without knowing ZEC price (and avoid selling ZECs without knowing capacity price)
- Using same optimization framework as in current capacity auctions (with one more constraint)

Co-Optimized Procurement

- **Objective Function:** Minimize capacity + ZEC procurement costs (or more accurately, "maximize social surplus")
- **Constraints:** Same as in current optimization, no additional locational constraints applied for ZECs
- **Prices:** Marginal cost of procuring additional ZECs and/or capacity (same as now)

Notes: *In the context of downward-sloping demand curves, the actual objective function is "maximize social surplus" or area under the demand curves for ZEC and capacity minus .

FCM-C Example: ZEC Price Formation

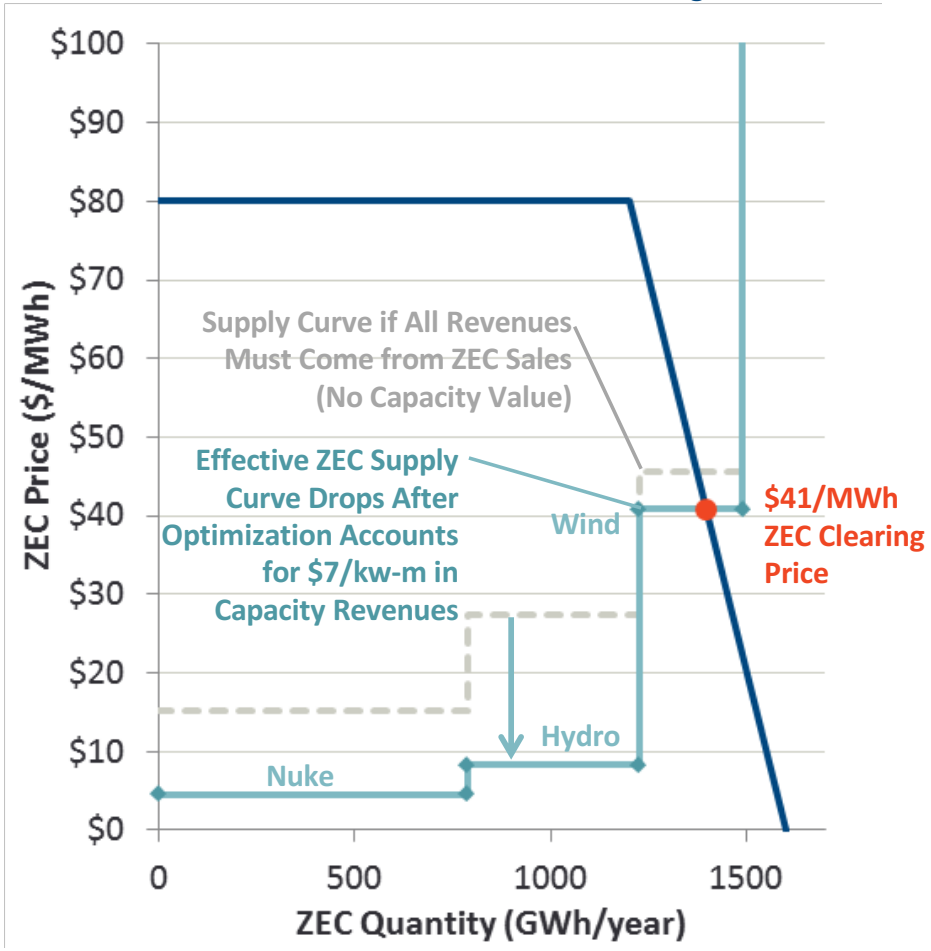
- If procuring ZECs independent of capacity, suppliers would need to take a risk on expected capacity revenues
- Joint procurement will account for capacity revenues by resource type, resulting in lower ZEC prices if capacity prices are higher

Resource Offers

		Nuke	Hydro	Gas CC	Wind
Resource Ratings					
Nameplate	*(MW_N)*	100	100	100	100
Capacity	*(MW_C)*	100	100	100	15
ZECs	*(GWh/year)*	788	438	0	263
Offer Price	*($/kW-m$_N$)*	$10	$10	$7	$10

ZEC Price Formation

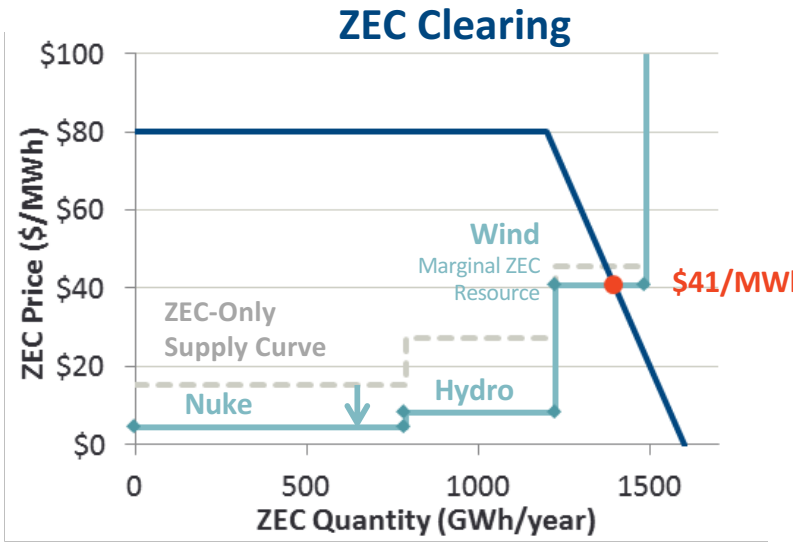
ZEC Supply Curve Before and After Accounting for and Without Joint Clearing



conservation law foundation

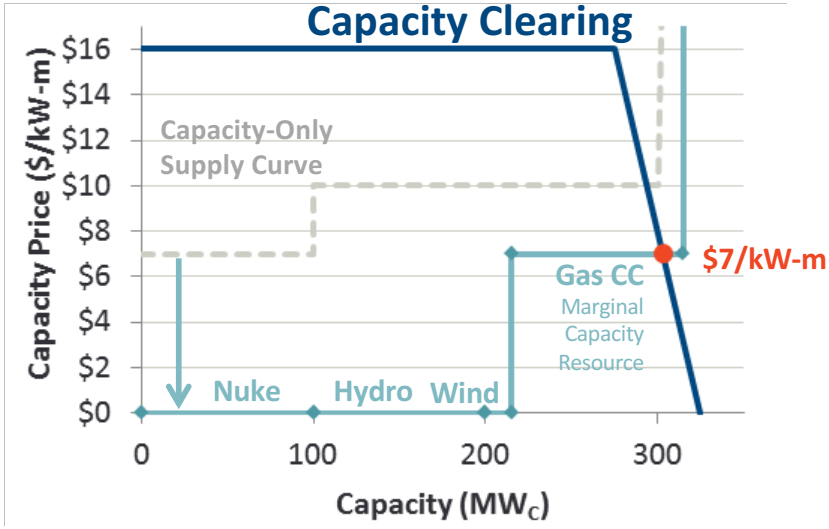
FCM-C Example: ZEC & Capacity Price Interactions

- Interaction between ZEC and capacity prices is offsetting: high ZEC prices translate to low capacity prices (and vice versa)
- ZEC + capacity payments are expected to be high enough to cover the investment costs for all cleared resources
- Results in cost-minimizing procurement between the two products



Resource Offers and Clearing Results

		Nuke	Hydro	Gas CC	Wind
Resource Ratings					
Nameplate	*(MW_N)*	100	100	100	100
Capacity	*(MW_C)*	100	100	100	15
ZECs	*(GWh/year)*	788	438	0	263
Offer Price	*($/kW-m$_N$)*	$10	$10	$7	$10
Revenues					
ZECs	*($M/year)*	$32	$18	$0	$7
Capacity	*($M/year)*	$8	$8	$8	$1
Total	*($M/year)*	$41	$26	$8	$8
Total	*($/kW-m$_N$)*	$34	$22	$7	$10



conservation law foundation

Notes: Supply curve for ZECs reflects minimum ZEC price that each resource is willing to accept, given the capacity clearing price. Similarly, supply curve for capacity reflects minimum capacity price each seller will accept once the ZEC price is known.

CO_2 Price and FCM-C Interactions

- CO_2 pricing and FCM-C markets will work together to decarbonize the electricity system
- Should not be viewed as additive to customer costs, since prices will be offsetting. Together, these markets will pay the variable and fixed costs needed to attract new clean energy resources, but no more
- For example, higher CO_2 prices will translate to:
  - Lower ZEC prices needed to attract clean energy (and more clean energy entering in the ZEC demand curve)
  - More clean energy entering will result in lower capacity prices
- Combined effects will create both short-term and long-term decarbonization incentives, as required under state policy

FCM-C Mechanics: Offer Review Trigger Price Modifications

- **ORTP Modified**:
  - CLF recommends returning the ORTP to its original purpose, to prevent artificial price suppression from those with a net negative position in the market
  - ORTP will be reformed to only apply to entities that have an incentive to suppress capacity and/or ZEC prices (such as net short entities, agents of the state, or their contractual counterparties). Developers that would enter the market on a merchant basis, without a net short position, and/or without a contractual counterparty will not be subject to the ORTP
  - The 200 MW (600 MW cumulative) renewables exemption will continue to apply for resources procured under any state-mandated PPAs or specialized procurements under payment mechanisms that are not broadly available to all non-emitting resource types

Advantages of FCM-C over other proposals

- Integrated clearing with FCA
  - No guess-work for renewable developers
  - Lowest cost *joint* solution to meet reliability & GHG goals
  - No distortion of capacity prices
  - Reduces tariff development
  - Minimal need for additional market monitoring
  - Aligns price lock-in period for new clean resources
- ZECs vs. CFD
  - Consumers hedge only the zero-carbon attribute value of the product
  - Suppliers retain commodity energy price risk

Next Steps towards FCM-C Implementation

- Process for setting ZEC demand curve
- ZEC imbalance market or mechanism
- ZEC unit qualification standards
- Seams issues
  - Qualification of imports to offer ZECs in FCM-C
  - Proof of delivery of imported ZECs
  - Attribute stripping on exports

All FCEM proposals need to address these points