Discriminatory capacity market pricing designs

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ICAP Working Group

May 22, 2025

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Today we outline the consumer cost and welfare impacts of a capacity market that is bifurcated in order to discriminate in price between new and existing capacity, both in the abstract and in practice

Overview: we have ten general observations regarding the impacts of discriminatory capacity markets

1. Discriminatory capacity markets can in some circumstances result in short-run reductions in consumer payments, by reducing producer surplus.

2. In the longer run, as more existing capacity inefficiently exits as a result of the artificially low capacity price, and is replaced with high-cost new capacity, the short-run consumer savings will tend to turn into higher costs for future consumers. The tighter the market is when the cap is put on, the sooner the NYISO will potentially have material adverse reliability impacts if there is a mismatch between the rate of exit of old capacity and entry of new capacity.

3. A discriminatory capacity market is less likely to be effective in reducing capacity payments, even in the short-run, in capacity zones with material capacity imports or the ability to export capacity.

Ten observations (cont.)

4. Discriminatory capacity markets will inherently result in a reduction in social welfare when lower cost existing capacity exits as a result of the lower price it receives and is replaced with higher cost new capacity.

5. The impact of the discriminatory design could be materially different between LSEs that own or have long-term contracts for existing capacity, and those that only buy capacity in the spot auction, with some LSEs losing even if the design results in short-run reductions in capacity costs for LSEs in aggregate.

6. Different prices for new and existing capacity will require changes to LSE auction settlements, with LSE obligations defined on a weighted average cost basis rather than on a megawatt basis. Such a design will also complicate LSE hedging and NYISO capacity market administration, with separate contract provisions for new and existing capacity and separate strip and monthly auctions for new and existing capacity.

Ten observations (cont.)

7. Capacity market costs for future consumers will be further increased by the changed expectations of investors in such a market, which will tend to raise the price at which investment in new capacity occurs and likely require more shifting of risks from investors to consumers.

8. Designs with lower prices for existing capacity will undermine the performance incentives in the current capacity market design.

9. A design in which “new” capacity is categorized as “existing” capacity after a period of time has the potential to bias procurement outcomes toward short-lived assets, even if they are higher cost.

10. There also will likely be strategic behavior by existing generators which may threaten to exit without higher capacity payments, which the NYISO will have to manage.

Discriminatory capacity markets:
Short-run impacts of lower prices for existing capacity

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We considered three approaches to a discriminatory auction design

There is more than one way to implement an auction that produces lower prices for existing than new capacity. We outline three approaches in this presentation. We describe these designs, explain their potential impact on capacity market payments, and discuss issues specific to the three designs in this section. We discuss other issues common to the designs in the next section.

The three designs are:

- Two-stage auction with separate supply curves for new and existing capacity, a single demand curve with a lower price cap for existing capacity.
- One-stage auction with a single supply curve for new and existing capacity and distinct demand curves.
- Two-stage auction with separate supply curves for new and existing capacity, and distinct demand curves.

There are more possible variations.

For the graphical illustrations of the short-run impacts of a discriminatory capacity market design we have made several general assumptions regarding the capacity supply curves

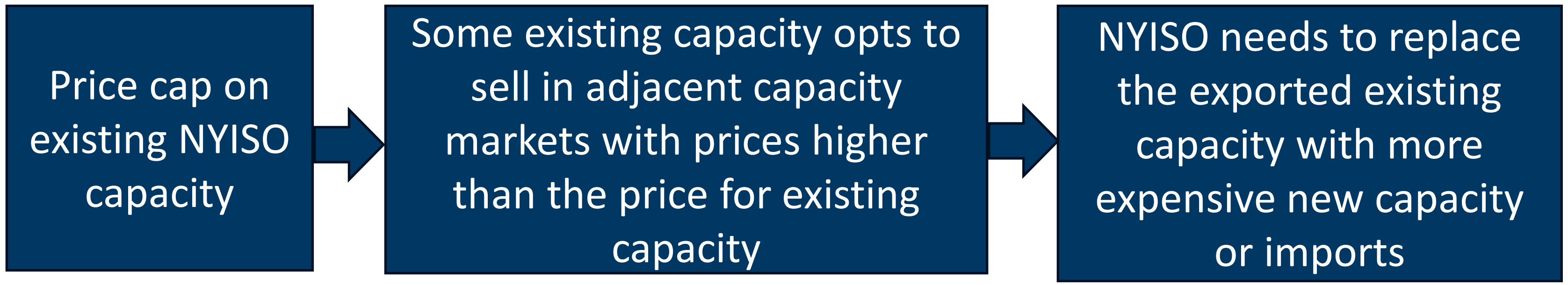
- In a prompt month capacity market auction, such as that used by the NYISO, the actual supply curve is not observed in the auction. The supply curves shown in our illustrative examples should be interpreted as the underlying supply curves that reflect actual resource going-forward costs. These supply curves would determine whether sellers participate in the auction, taking account of observed and expected future capacity prices.
- Even the costs of new capacity would be sunk by the time the prompt auction is cleared, so new capacity would be incentivized to submit price-taking supply offers. It is possible that the only capacity that might submit non-price taking offers in the prompt auction would be imports and some demand response. However, this might not always be the case.

Other important general assumption are listed below

- Existing nuclear capacity would be cleared as existing capacity but would receive additional ZEC payments, reducing its net going forward costs.
- There would be a need to define "new" and "old" capacity. We assume that "new" capacity would remain "new" for some number of years before it is reclassified as "existing" capacity. We discuss the implications of new capacity being reclassified as "existing" capacity further in slides 48-50.
- Capacity imports would be treated as "new" capacity (discussed in detail on the next slide).

A general issue with all implementations of discriminatory designs is how to deal with capacity imports and exports

- If the NYISO directly or indirectly sets a price for imported capacity prices that is below the value in adjacent markets, NYISO will not get capacity imports. This would result in very high prices for new capacity and adverse reliability impacts.
- If the NYISO directly or indirectly sets a price for existing capacity below the price of capacity in adjacent markets, existing capacity will be exported.
- If the NYISO directly or indirectly caps prices for existing capacity but pays the new capacity price for imported capacity, NYISO could end up exporting its capacity and replacing it with imported capacity that will be less reliable during regional shortages.
- Setting a below market price for existing capacity does not appear to make sense for upstate capacity that could readily be exported to PJM or ISO-NE.



Discriminatory capacity markets:

First Approach:

- two-stage auction
- separate new and existing supply curves
- single demand curve with a lower price cap for existing capacity

Two-stage discriminatory auction design with separate supply curves and a single demand curve with a lower price cap for existing capacity

We first illustrate the operation of a discriminatory auction using a two-stage auction design with separate supply curves for new and existing capacity

- This design would use the same demand curve for new and existing capacity but apply a cap to the price of existing capacity in the Stage I auction for existing capacity. The remainder of the demand curve for existing capacity would be the same as used for new capacity.
- The Stage II auction would clear with new capacity offers added to the cleared existing capacity using the full demand curve with the normal demand curve price cap.

Two-stage discriminatory auction design with separate supply curves and a single demand curve with a lower price cap for existing capacity

The NYISO could attempt to set the price cap at a level at which it was expected that it would cover the going-forward costs of most existing generation.

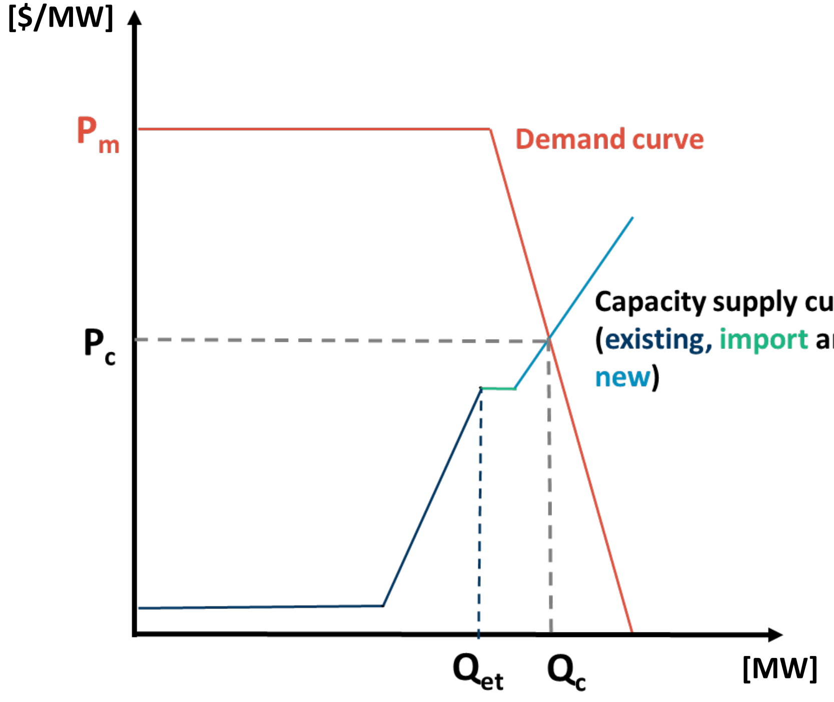
- This would be far from simple since going-forward costs are hard to assess, and most bids in a prompt month will be price-taking, not revealing information about going-forward costs.
- Attempting to set the price cap based on going forward costs would also likely entail year to year adjustments in the price cap, requiring something similar to the demand curve reset process every year, which could add further cost and complexity to capacity market administration.

The two-stage discriminatory capacity market design would pay lower prices to existing capacity than to new capacity with the intent of reducing short-run consumer costs, while maintaining investment incentives for new capacity

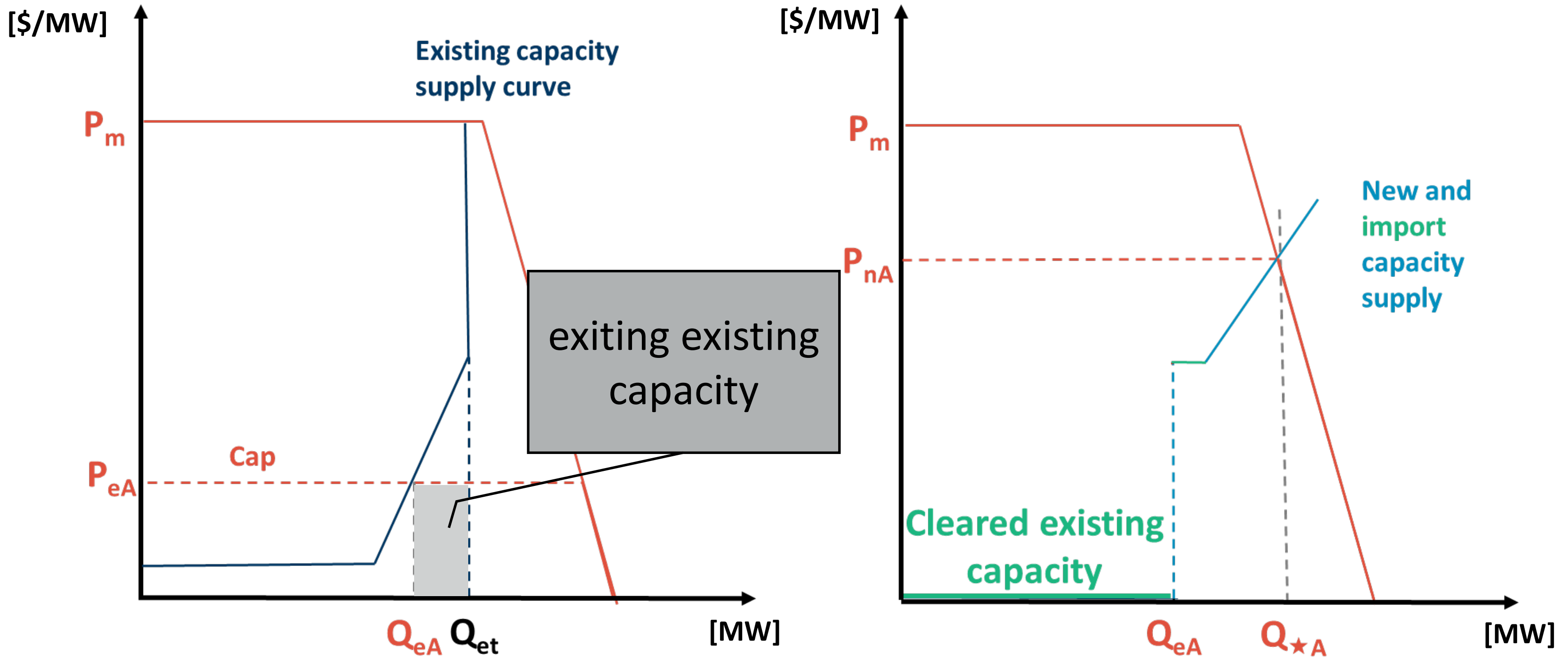
We illustrate the potential reduction in short-run consumer payments with an example of an illustrative non-discriminatory capacity auction, and an illustrative discriminatory market in which existing capacity is cleared against the demand curve with a low price cap (P_{eA}) ("Scenario A"). New capacity is cleared in the Stage II auction with the full demand curve and cleared existing capacity is modelled as price taking.

SCENARIO A: low going-forward costs of existing capacity, low offer prices from incremental new capacity

Illustrative Non-discriminatory Auction



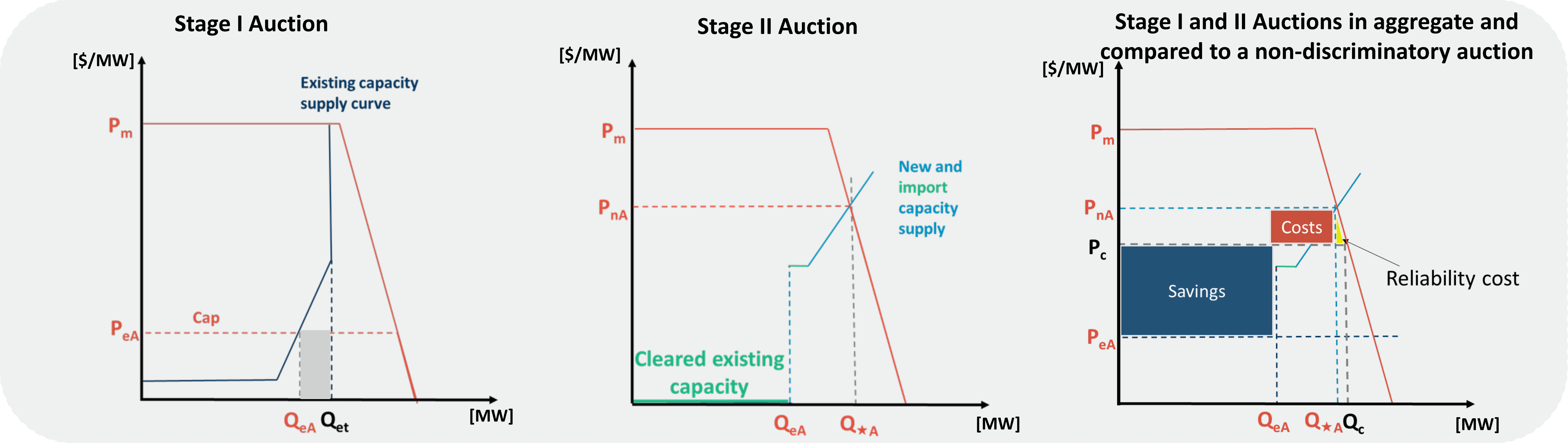
Stage I (left) and Stage II (right) of an illustrative Discriminatory Auction



P_m: price cap non-discriminatory auction P_c: non-discriminatory cleared capacity price Q_{et}: supply existing capacity Q_c: capacity cleared in non-discriminatory auction
P_{eA}: price cap existing capacity Q_{eA}: existing capacity cleared in discriminatory auction P_{nA}: price new capacity $Q_{\star A}$: total capacity cleared in discriminatory auction

In Scenario A, only a small amount of existing capacity exits the market as a result of the lower price for existing capacity and there can be considerable short-run cost saving to consumers in aggregate from discriminatory pricing

SCENARIO A: low going-forward costs of existing capacity, low offer prices from additional new capacity

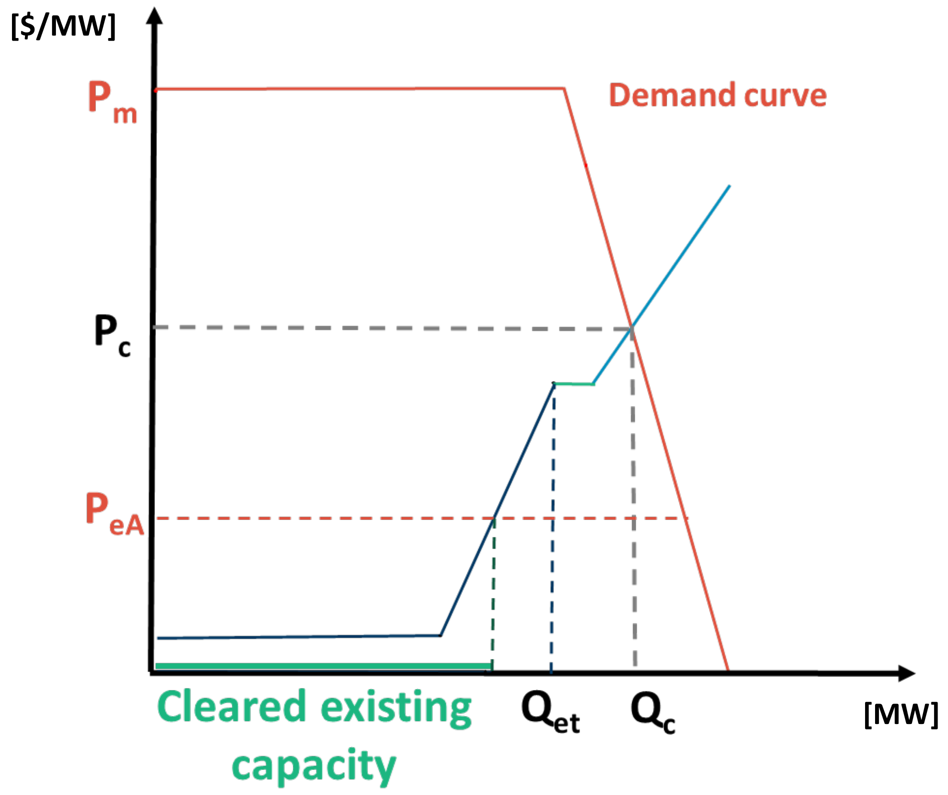


- The capacity price for existing capacity (P_{eA}) is set well below the competitive clearing price for capacity (P_c) in Scenario A
- A small amount of existing capacity shuts down as a result of the price cap (Q_{et}-Q_{eA}), requiring that more new capacity be procured in the discriminatory auction relative to the non-discriminatory auction
- The price paid to new capacity (P_{nA}) is higher than the price in the non-discriminatory auction (P_c)

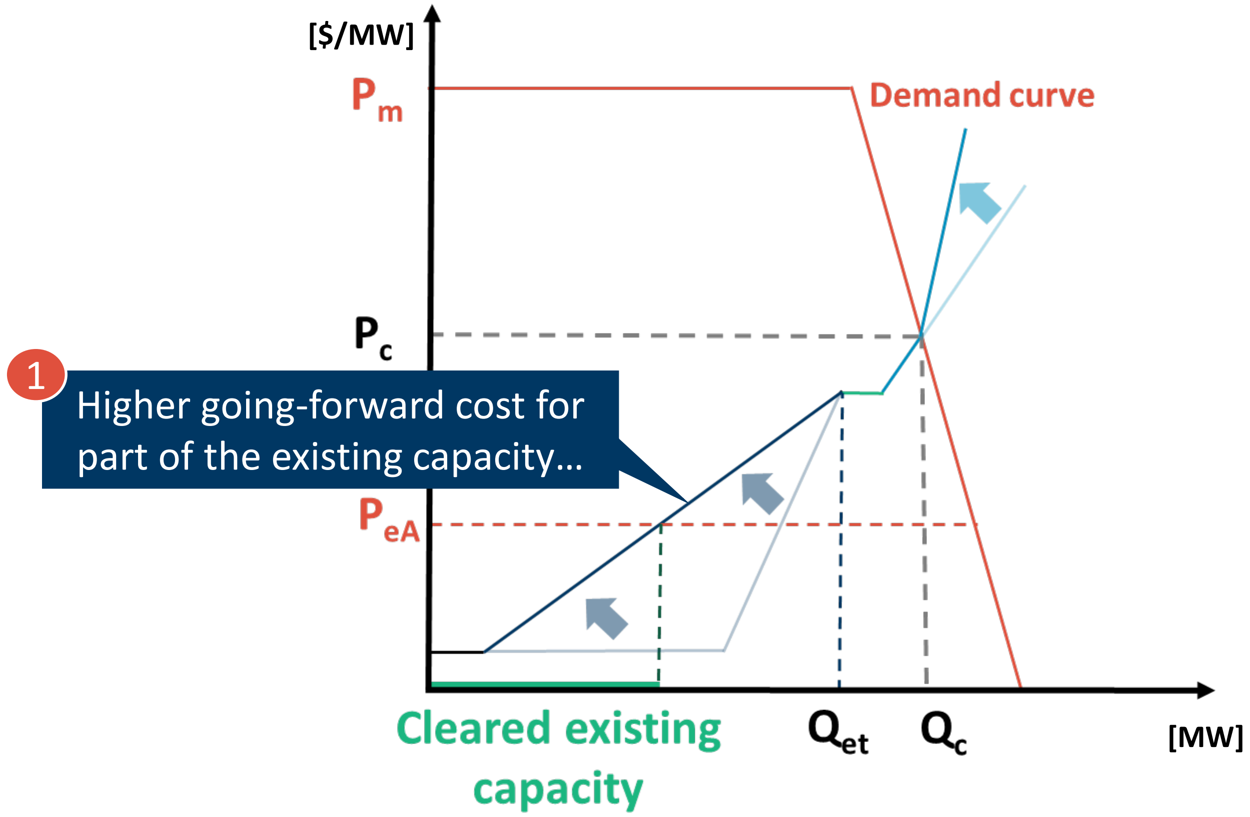
The cost savings from paying lower capacity price for existing capacity (dark blue area) is larger than the additional cost for procuring new capacity (red area) and reliability costs due to procuring an overall less volume of capacity (yellow area), so the implementation of the discriminatory capacity market reduces consumer costs in the short run.

Any reduction in short-run consumer costs from a lower price for existing capacity can decrease over time and turn into higher costs as the amount of existing capacity that exits the market increases and must be replaced with higher cost new capacity

SCENARIO A: low going forward costs of existing capacity, moderate costs for additional new capacity



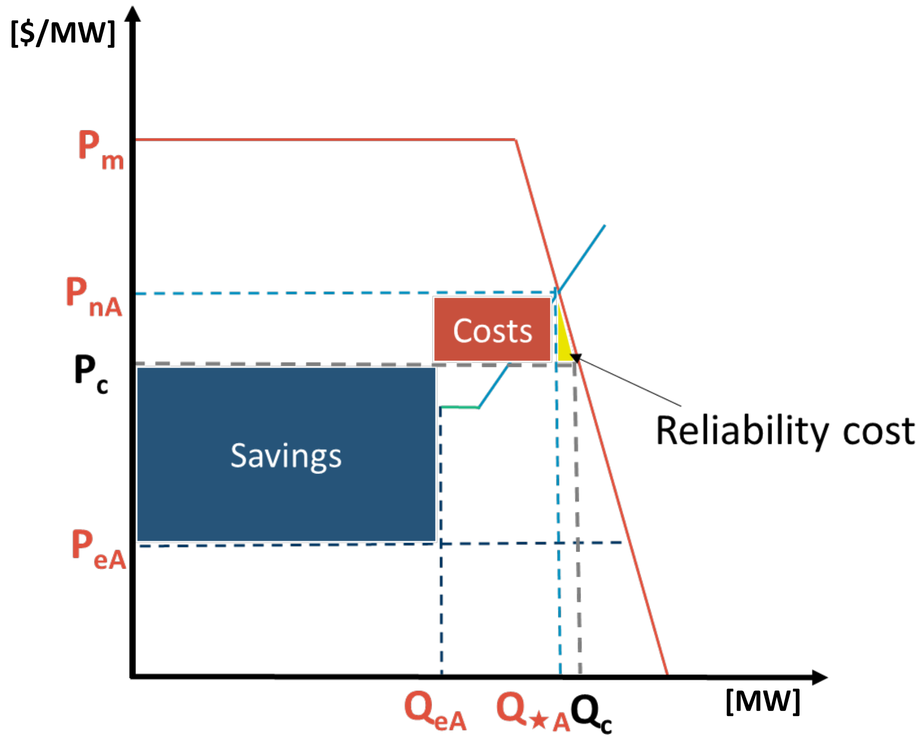
SCENARIO B: high going forward costs of existing capacity, high costs for additional new capacity



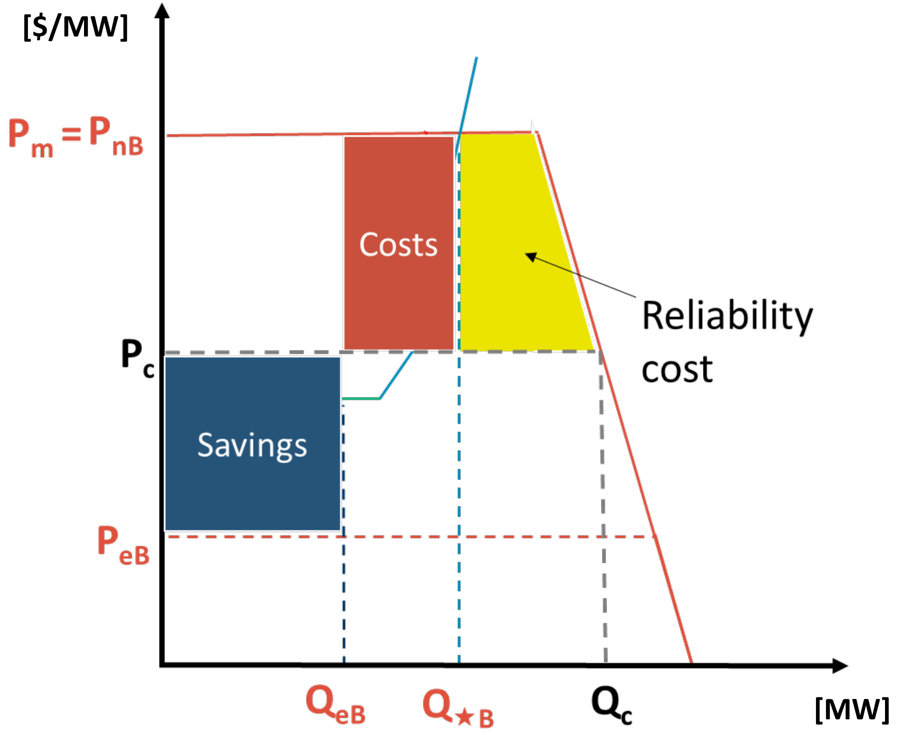
With larger amounts of existing capacity inefficiently exiting, and higher cost new capacity than in Scenario A, the short-run consumer savings turn into increased consumer costs in the long-run in Scenario B

The red and yellow regions, higher payments to existing capacity and reliability costs of less capacity are now larger than the blue region (reduced payments to existing capacity).

SCENARIO A: low going forward costs of existing capacity, low price cap



SCENARIO B: high going forward costs of existing capacity, high offer prices from additional new capacity and the same price cap



P_m: price cap non-discriminatory auction capacity

P_c: non-discriminatory cleared capacity price

Q_c: capacity cleared in non-discriminatory auction

$P_{eA/B}$: price cap existing capacity in Scenario A/B

$P_{nA/B}$: price new capacity in Scenario A/B

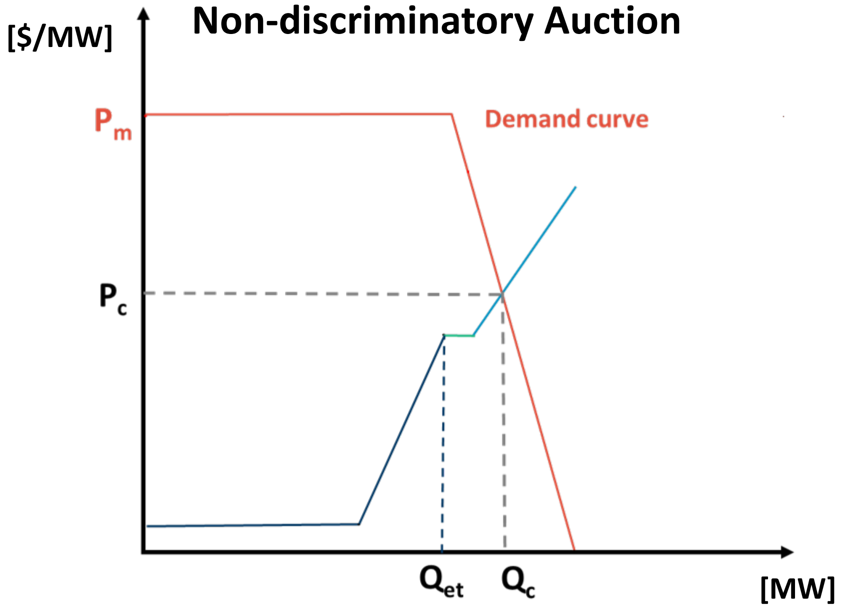
$Q_{eA/B}$: existing capacity cleared in discriminatory auction in Scenario A/B

$Q_{\star A/B}$: total capacity cleared in discriminatory auction in Scenario A/B

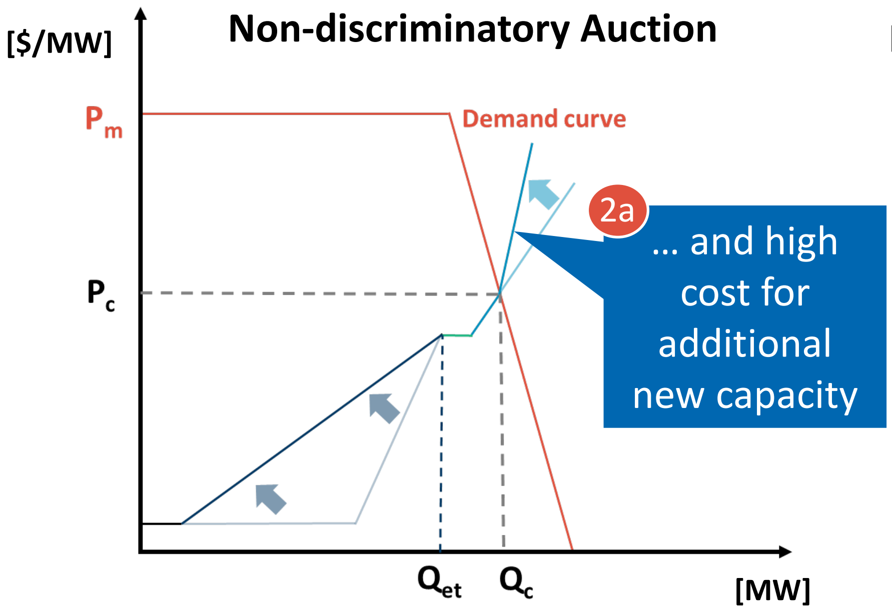
The adverse impact of discriminatory markets on consumer costs can be magnified if the auction price for new capacity is inflated by supply chain issues that reduce the supply of new capacity that is needed to replace existing capacity that shuts down, or by faster-than-expected load growth

This risk also exists in the current non-discriminatory capacity market design if capacity shuts down in expectation of lower prices that do not materialize or load growth is faster than expected, but under the current market design, high capacity prices due to delayed entry or load growth will tend to reduce exit of existing capacity and thereby reduce the capacity price and reliability impacts.

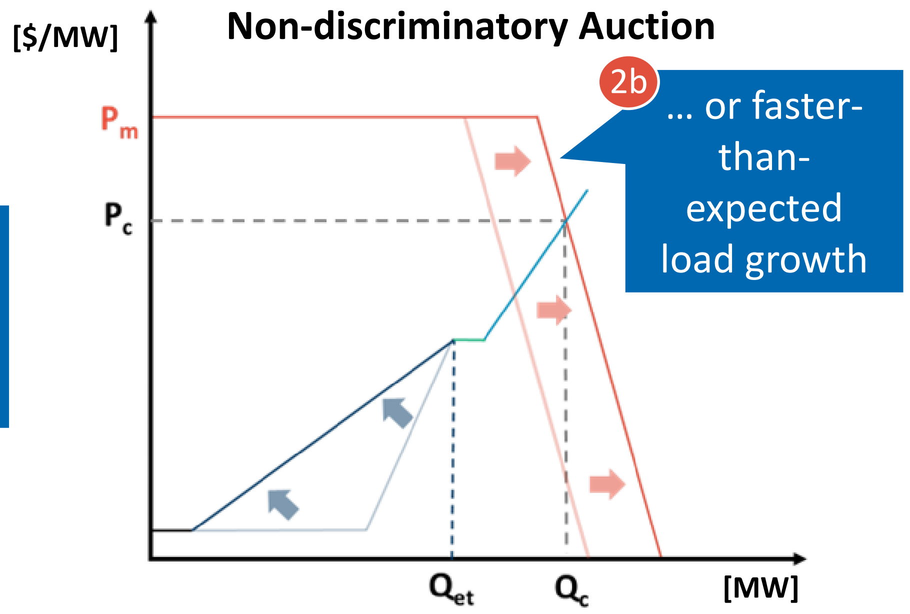
SCENARIO A: low going forward costs of existing capacity, moderate costs for new capacity



SCENARIO B: high going forward costs of existing capacity, high costs for new capacity



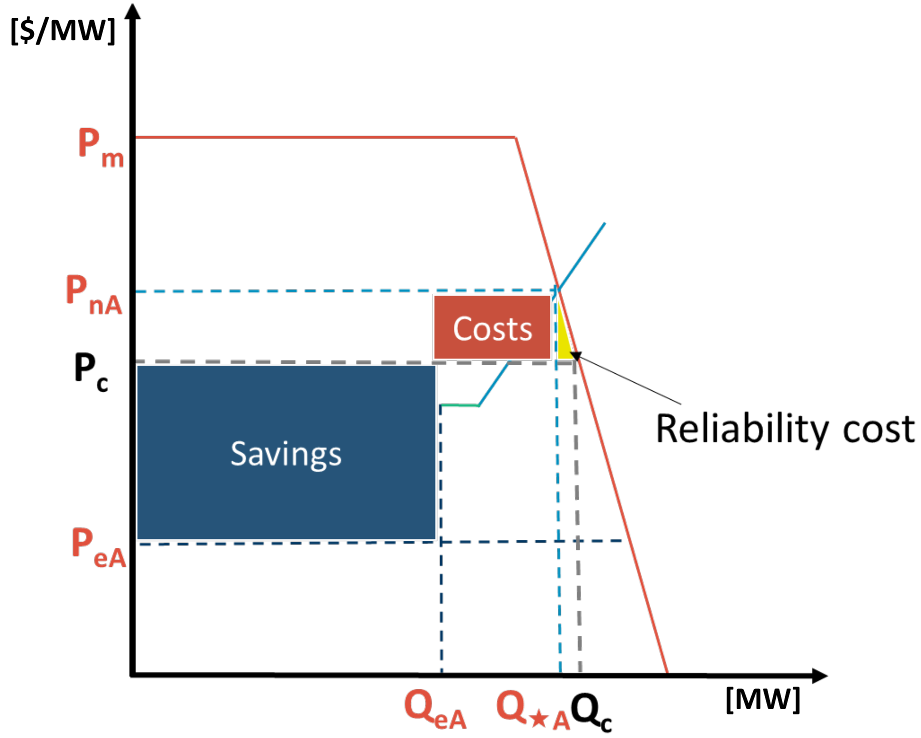
SCENARIO C: high going forward costs of existing capacity, moderate cost for new capacity, faster-than-expected load growth



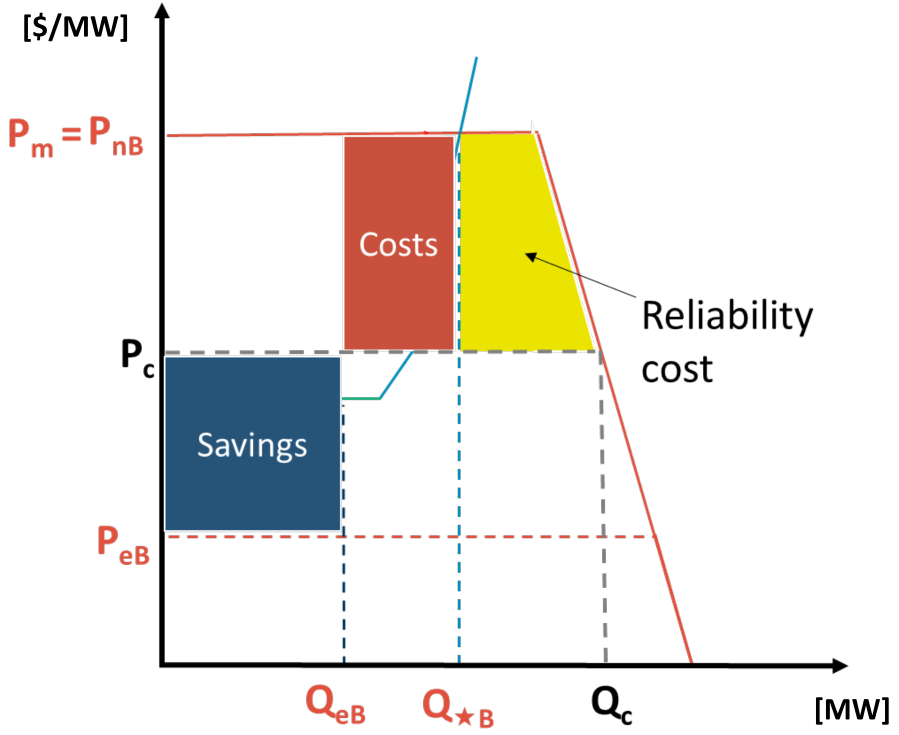
The tighter the NYISO capacity market is when a cap is applied to the price of existing capacity, the sooner the NYISO will potentially have material adverse reliability impacts if there is a mismatch between the rate of exit of old capacity, the entry of new capacity, and load growth

As illustrated below in Scenario B, with a price cap on existing capacity, the NYISO could have continued exit of existing capacity while new capacity prices skyrocket due to delayed entry and/or strong load growth. This outcome does not seem tenable from a consumer cost or reliability perspective, although it would be beneficial for suppliers of new capacity that is not yet under a contract.

SCENARIO A



SCENARIO B



P_m: price cap non-discriminatory auction capacity
P_c: non-discriminatory cleared capacity price
Q_c: capacity cleared in non-discriminatory auction
$P_{eA/B}$: price cap existing capacity in Scenario A/B
$P_{nA/B}$: price new capacity in Scenario A/B
$Q_{eA/B}$: existing capacity cleared in discriminatory auction in Scenario A/B
$Q_{\star A/B}$: total capacity cleared in discriminatory auction in Scenario A/B

With larger amounts of existing capacity inefficiently exiting and higher cost new capacity than in Scenario A, the short-run consumer savings turn into increased consumer costs in the long-run in Scenario B

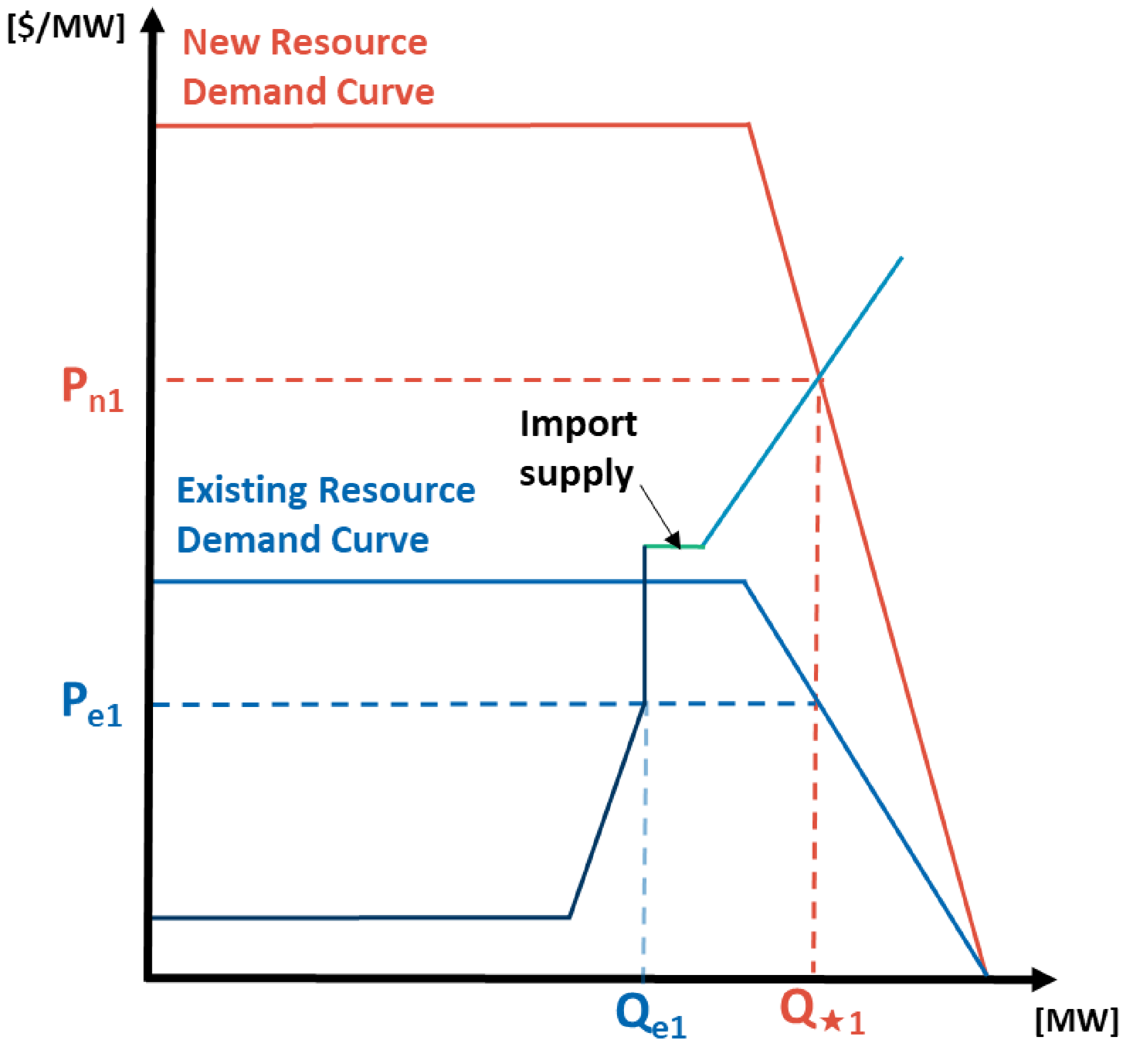
Overall, while the short-run consumer cost impact of a discriminatory auction can be ambiguous as shown in Scenario A, a discriminatory capacity auction will inherently reduce social welfare relative to procurement in a competitive auction.

- The more exit of existing capacity whose operation would be economic with the non-discriminatory capacity payment, and the more costly additionally procured new capacity, the larger the reduction in social welfare.
- This holds true for all three approaches to discriminatory capacity markets. The details of the implementation will impact the magnitude of the welfare impact.
- We illustrate this in the Appendix using the first approach.

Discriminatory capacity markets:
Second Approach:
- single-stage auction
- single supply curve
- distinct new and existing demand curves

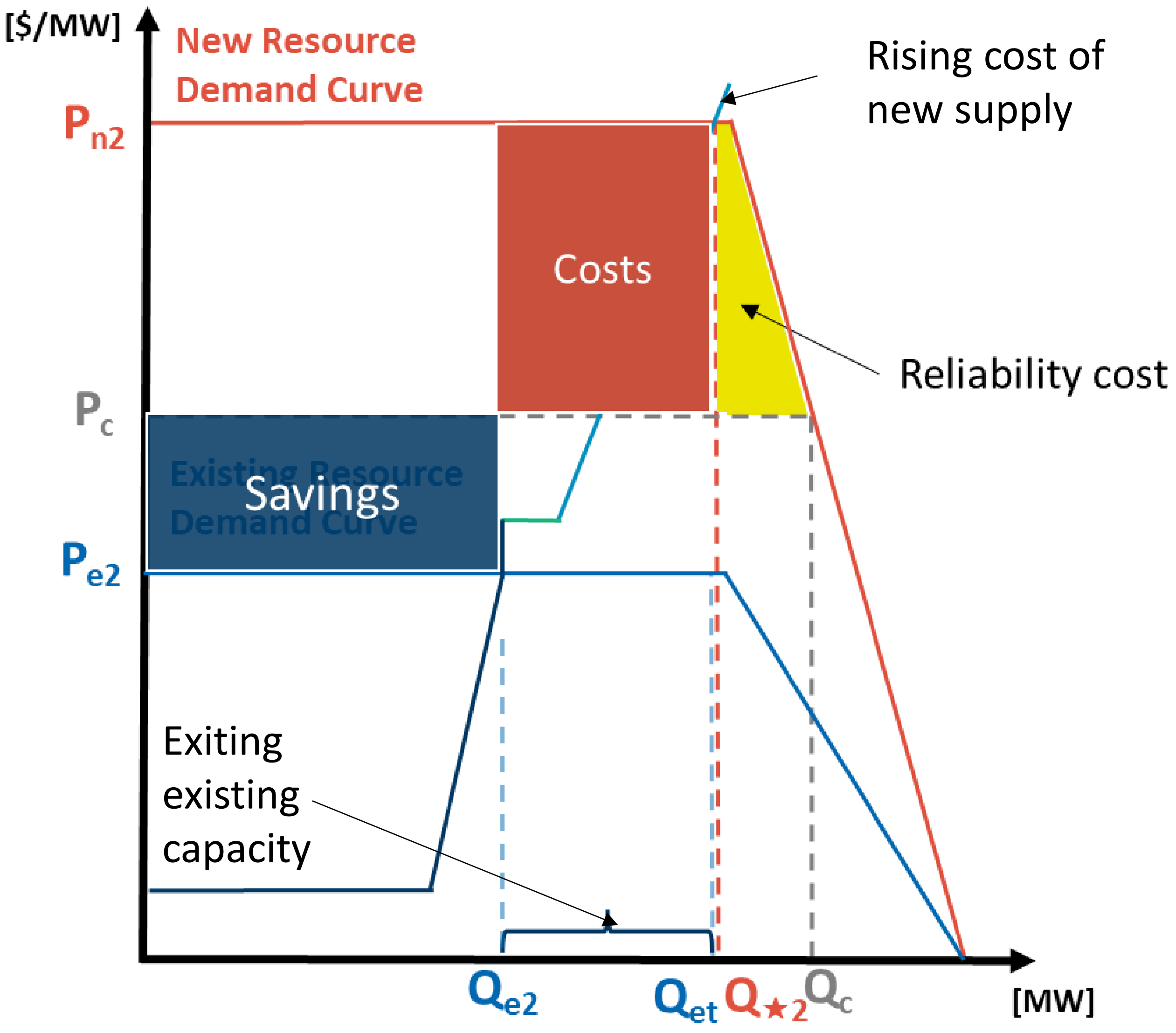
In principle, a lower price for existing capacity could also be set using different demand curves for existing and new capacity, without setting an explicit price cap for existing capacity. Below we illustrate a single-stage auction with a single supply curve for capacity and distinct demand curves.

- The NYISO could utilize two distinct demand curves — one for new resources and one for existing resources — to produce distinct clearing prices:
  - Reference point prices would be determined using a different methodology for existing capacity.
  - All capacity suppliers would participate in a single capacity auction but would be classified as either "new" or "existing".
  - A single supply curve, encompassing both new and existing resources, would rank bids economically.
- Capacity would be compensated at the market clearing price determined by the demand curve corresponding to its resource classification as either new (P_{n1}) or existing (P_{e1}).



As with the first design, if only a small amount of existing capacity exists the market as a result of the lower price for existing capacity, there can be considerable short-run cost savings to consumers in aggregate from the discriminatory pricing.

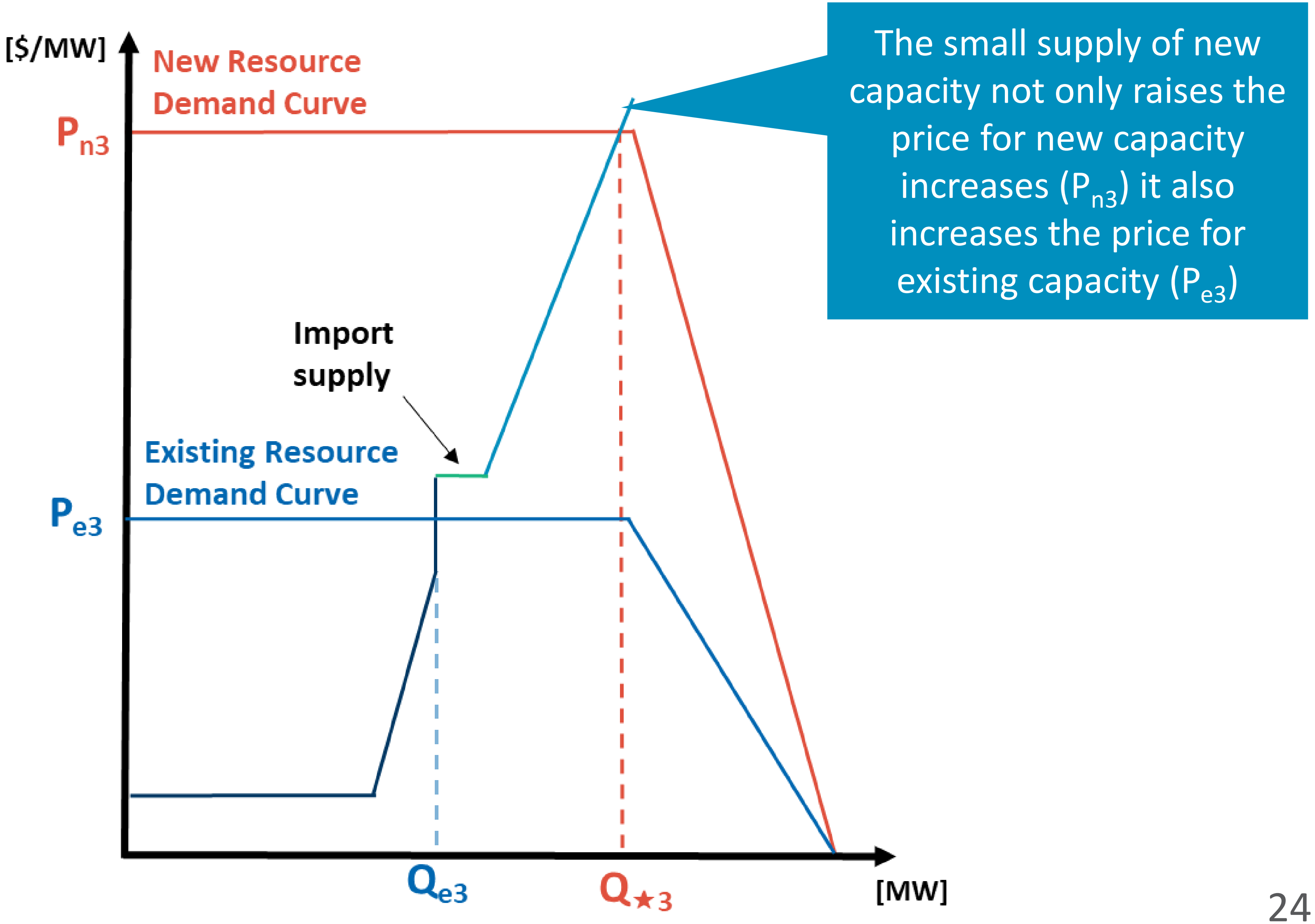
However, these cost savings will be reduced as the amount of existing capacity that shuts down as a result of the lower capacity price increases and further reduced by delays in the entry of new capacity or unexpected increases in demand.



This design would be somewhat less pernicious than the first approach in its impacts on capacity prices and reliability when the entry of new capacity is delayed, or load growth is greater than expected, and new capacity prices rise to very high levels, because the price of existing capacity would also rise.

- This design would provide more incentive than the first design for high cost "existing" capacity to remain in operation when new capacity prices rise to unexpectedly high levels.

- This feature should therefore somewhat reduce the potential for skyrocketing of prices for new capacity while "existing" capacity continues to shut down due to very low capacity prices.



Demand curve construction

The “existing” capacity demand curve could be set as a fraction of the price on the “new” capacity demand curve.

- This approach would provide more predictability regarding future prices than if the existing capacity demand curve were set in an annual process.
- This approach would also reduce the administrative burden on the NYISO and stakeholders relative to re-determining the existing capacity demand curve slope on an annual or more frequent basis.

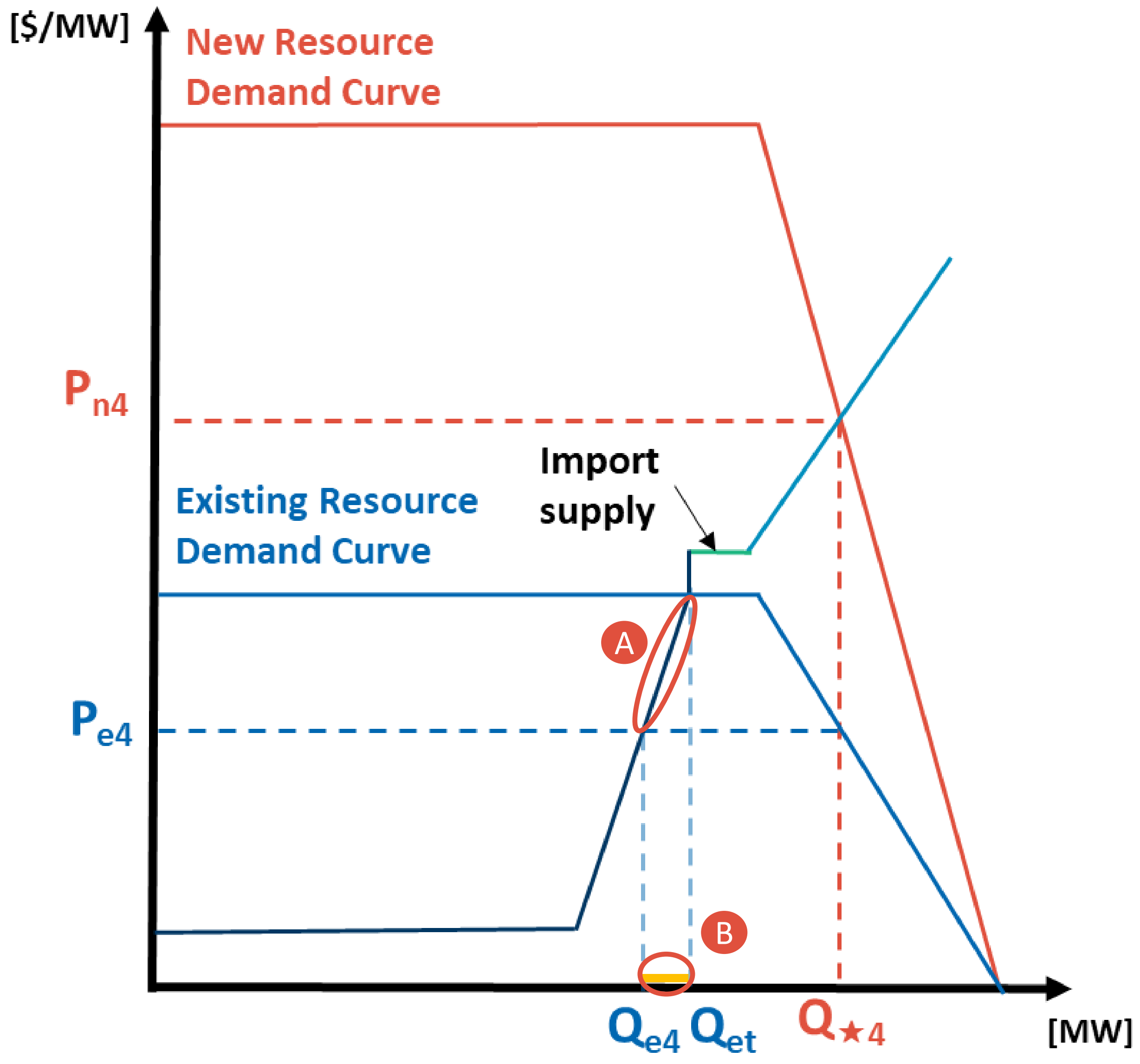
Demand curve construction (cont.)

Alternatively, the NYISO could attempt to set the existing capacity demand curve based on the expected going-forward costs of most existing capacity.

- As with the price cap approach discussed above, this would be far from simple since going-forward costs are hard to assess, and most bids in a prompt month auction will be price-taking, not revealing information about going-forward costs.
- This approach would be even more difficult to implement with a sloping demand curve because whether the demand curve would cover the going-forward costs of particular resources would depend on the clearing quantity on the new capacity demand curve, as well as the slope of the existing capacity demand curve.
- If the existing demand curve is not defined as a function of the new capacity demand curve, year to year or more frequent revisions of the existing capacity demand curve would reduce the predictability of future capacity prices and could speed the exit of existing capacity when lumpy staying in business investments are needed.

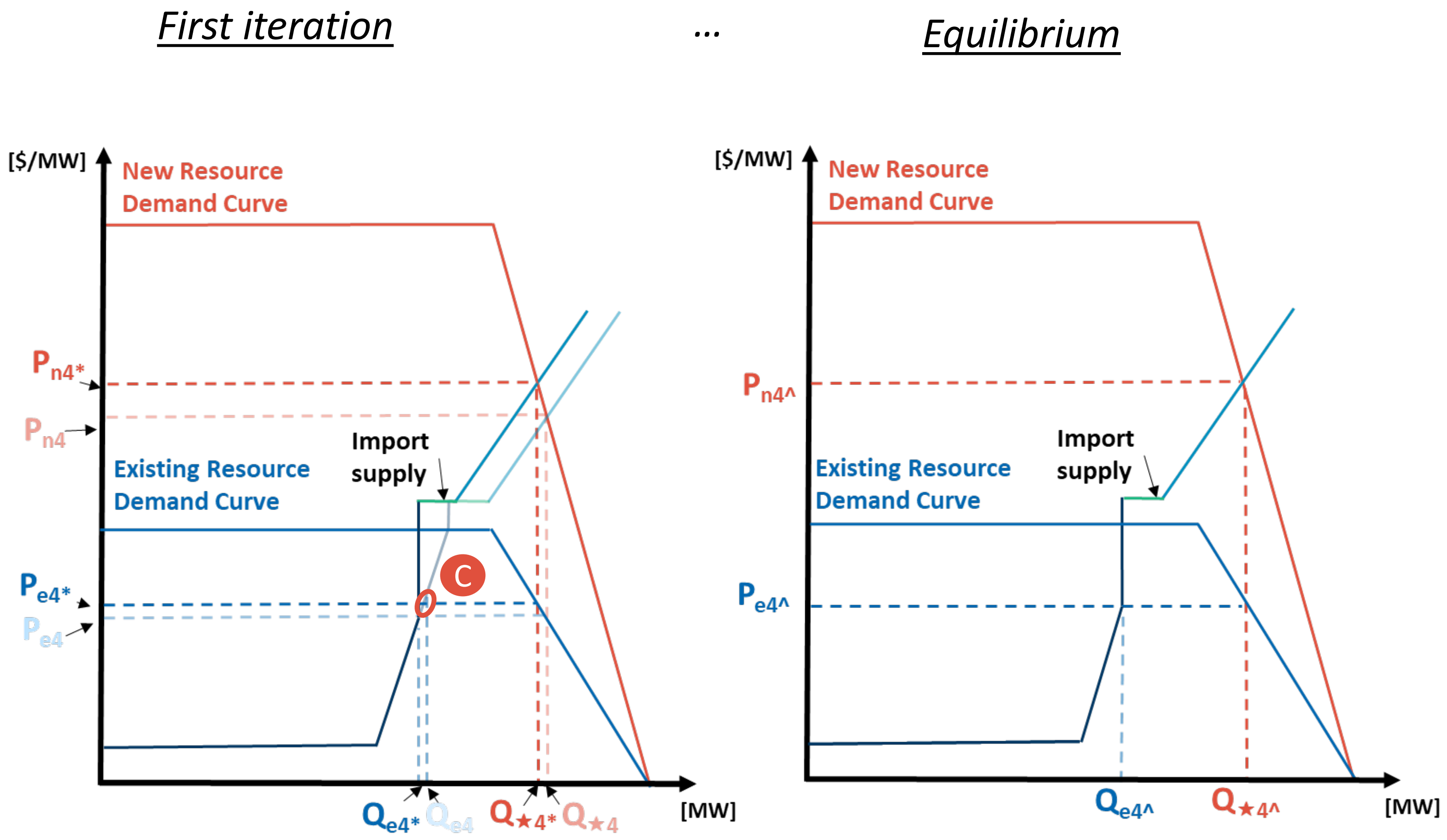
A discriminatory capacity pricing design based on a distinct demand curve for existing capacity and a single supply curve has two limitations relative to simply imposing a price cap on existing capacity in a two-stage action. One limitation is the possibility for anomalous outcomes.

Limitation 1	The use of a single supply curve for new and existing capacity creates the potential for anomalous outcomes if existing capacity is offered at prices that exceed the clearing price for existing capacity but are lower than the price for new capacity (see A). The existing capacity would presumably not be cleared at price above the existing capacity price, but if so, too little capacity would be procured (see B).

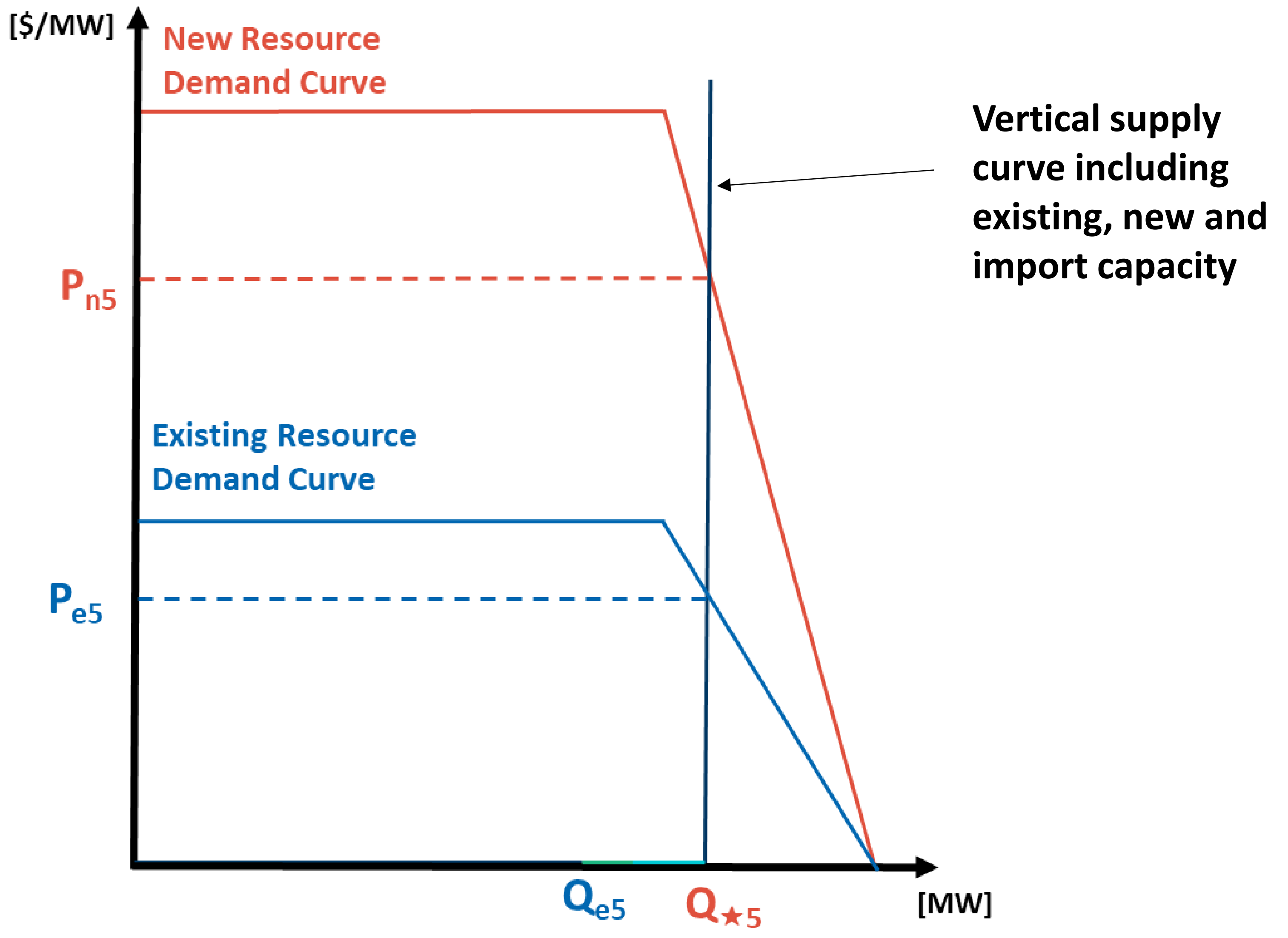


An iterative approach could be used to avoid anomalous outcomes caused by existing capacity with non-zero offer prices, but this could become unworkable if there is a material amount of existing capacity with non-price taking offers.

- If existing capacity is offered at prices that exceed the demand curve price for existing capacity, the auction could be re-cleared removing that capacity. However, then the new and existing capacity prices would rise, and might rise to a level higher than the offer price of some of the removed existing capacity (C). The auction would need to re-clear again with this capacity re-inserted until an equilibrium is reached.
- If there are a lot of offers at non-price-taking offers such approach would be unworkable.



However, there probably would not often be anomalies, because almost all existing capacity in a prompt month auction would be offered at $0 resulting in a vertical supply curve in the spot auction

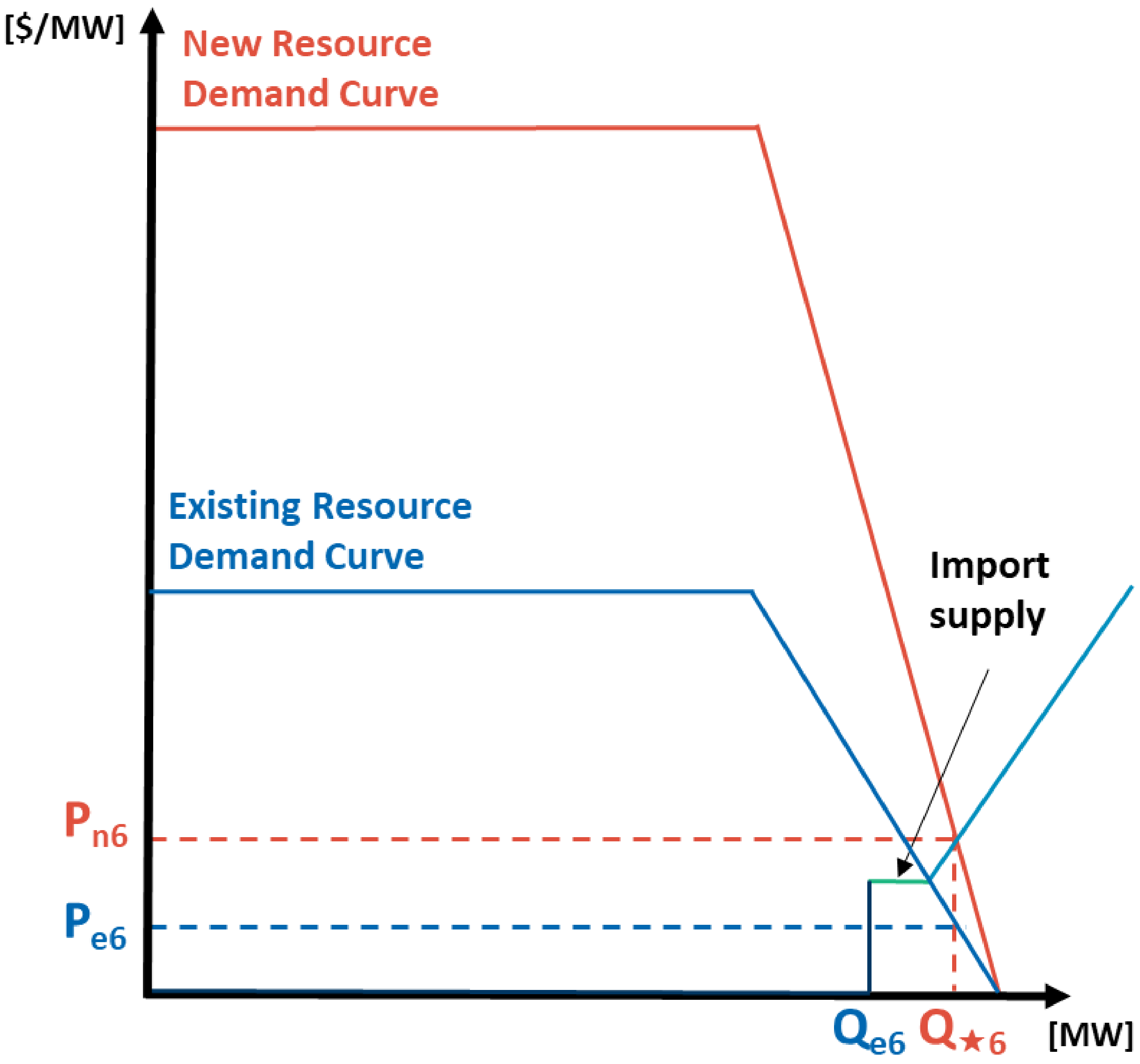


A second limitation of such a two-demand curve design combined with a single supply curve approach is that it would produce very low capacity prices for existing capacity during periods of surplus capacity

Limitation 2

When the supply curve clears on the lower portion of the demand curve, the price of existing capacity could be very low.

This could accelerate the exit of existing capacity and accelerate increases in future capacity prices.



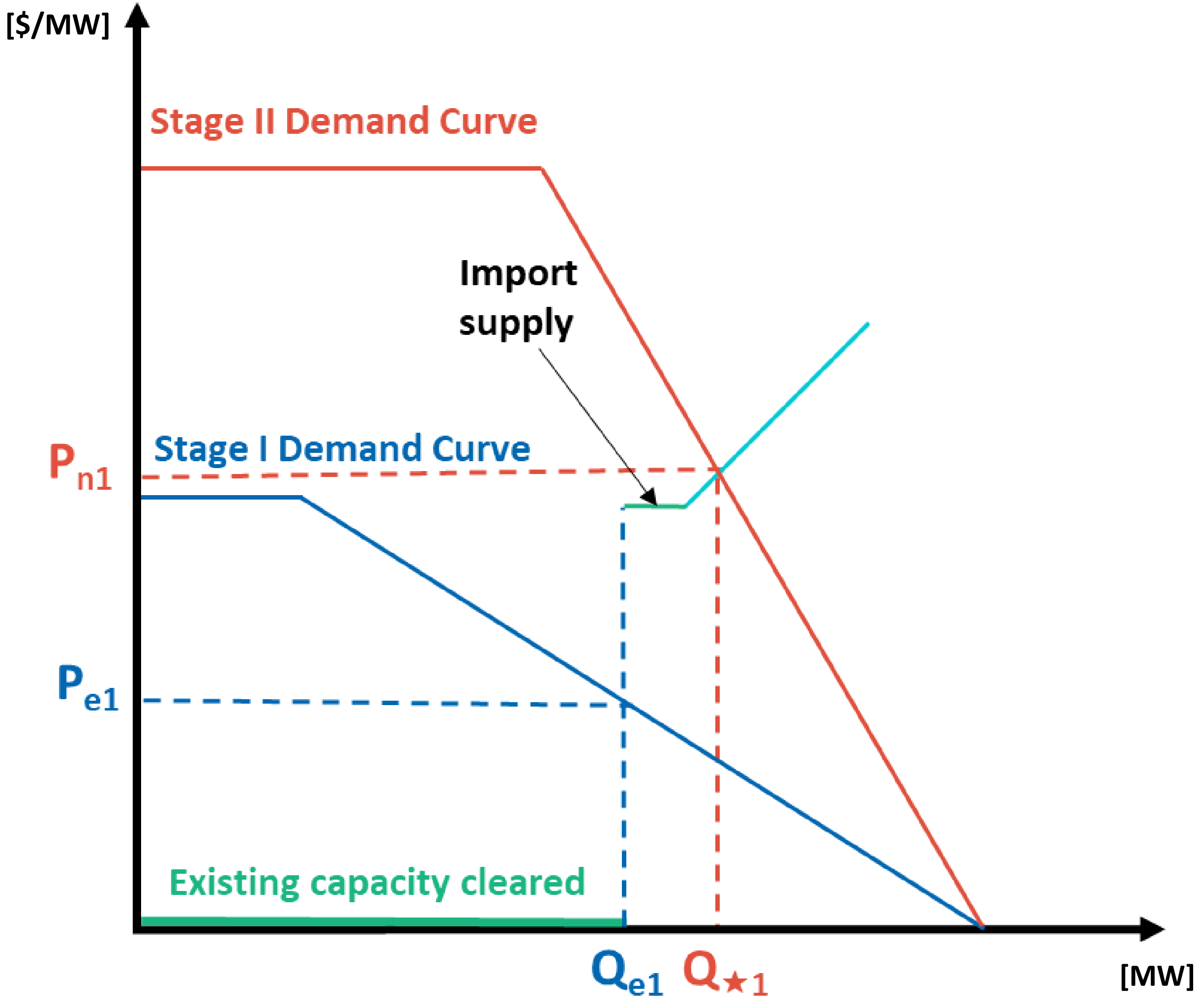
Discriminatory capacity markets:

Third Approach:

- two-stage auction
- separate new and existing supply curves
- distinct new and existing demand curves

A third approach to a discriminatory capacity pricing design would use two demand curves in a two-stage auction with separate supply curves for new and existing capacity

- The NYISO could effectively achieve a similar outcome as with a price cap by setting the demand curve for existing capacity so that the amount of existing capacity expected to be offered as price-taking supply would result in the same price as the intended price cap.
- P_{e1} is the clearing price for the existing capacity in Stage I, equaling the intended price for the existing capacity if Q_{e1} is offered.
- If this design operated as intended, it would be similar to the second design in its impacts on prices and reliability.



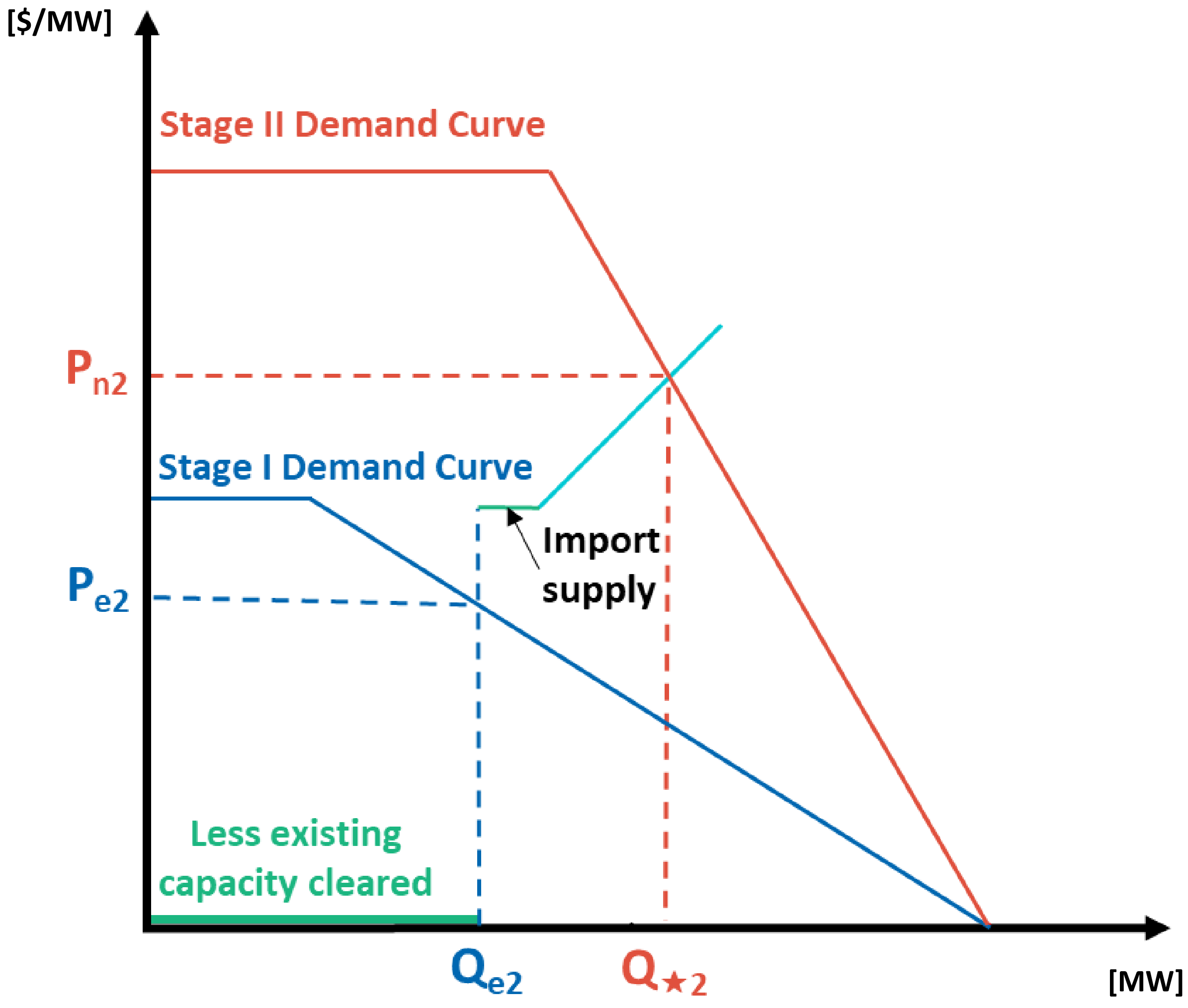
Third Approach: Demand curve construction

As under the first and second designs, the NYISO could attempt to set the demand curve so that the Stage I auction would clear at a level at which it was expected that it would cover the going-forward costs of most existing generation.

- This would be far from simple since going-forward costs are hard to assess, and most bids in a prompt month will be price taking and not reveal information about going-forward costs.
- Moreover, as under the second design, this would be impractical if there is a glut of capacity and the price for capacity would clear on the far right portion of the demand curve. Avoiding undue exit would require that the "existing" capacity demand curve have the same slope as the "new" capacity demand curve.

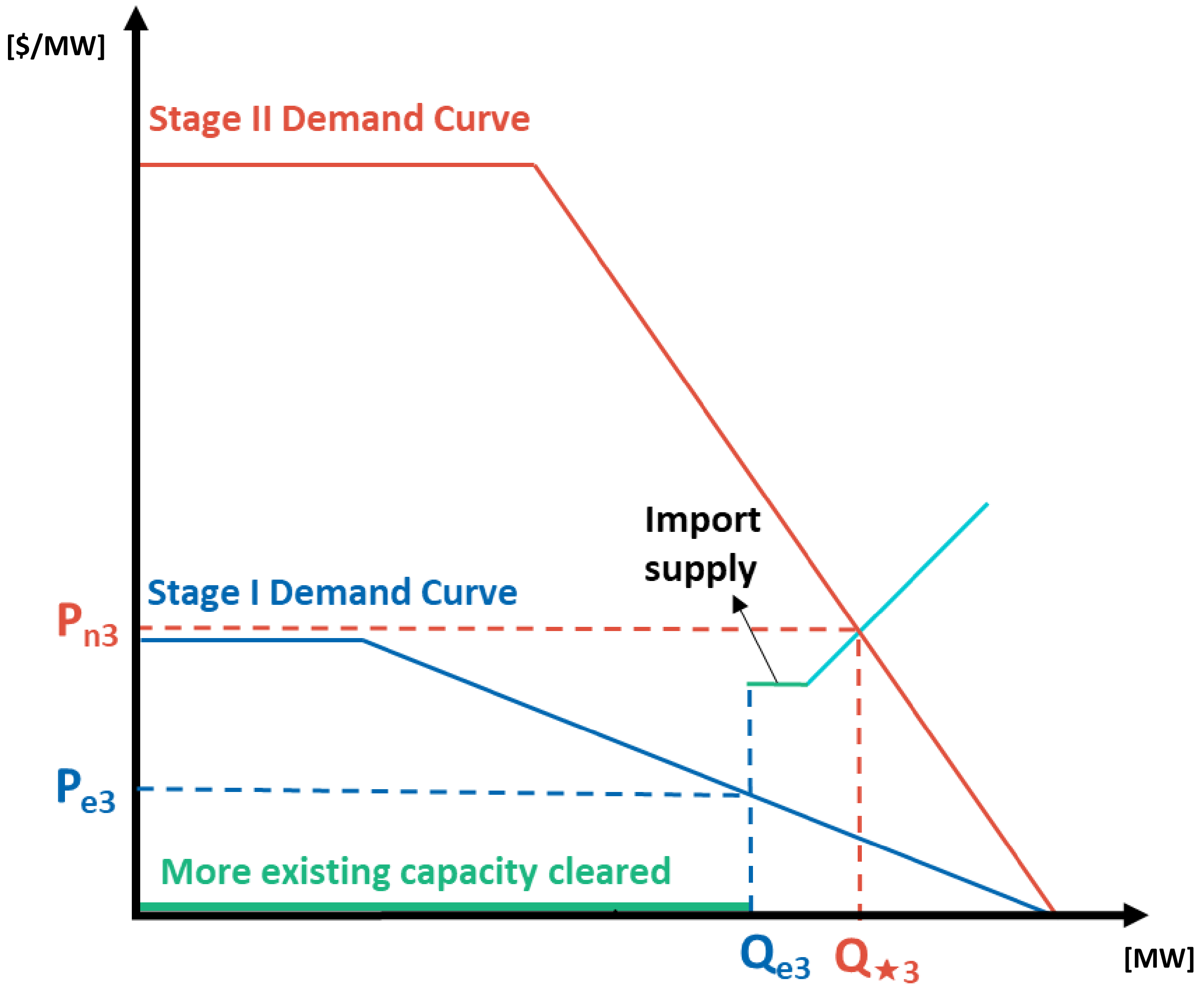
Such a design would avoid the potential for anomalous outcomes under the second design as a result of offer prices for existing capacity that exceeded the clearing price for existing capacity. However, clearing the auctions separately could also lead to unintended outcomes.

Limitation 1	With the two-demand curve approach and two stage auctions, over-estimating the volume of existing capacity that would remain in operation could result in much higher prices for existing capacity than intended, even if the price for new capacity is not that high. While as discussed for the previous design a higher price for "existing" capacity could be a good thing when there is a high price for new capacity, this design decouples the prices in a way that could result in unintended outcomes and not send an appropriate price signal.



Other limitations of the design

Limitation 2	As with the second approach, the lower slope of the "existing" capacity demand curve could result in very low prices for existing capacity when the supply curve clears on the lower portion of the demand curve, accelerating exit and increasing capacity prices.
Limitation 3	This approach appears to require the NYISO to adjust the demand curve from auction to auction to reduce the likelihood of anomalous outcomes. This would eliminate any certainty regarding future prices for existing capacity and increase the cost and administrative burden of the capacity market auctions.



Discriminatory capacity markets:
Summary of short-run impacts

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Fundamental issues with discriminatory capacity markets

All three designs assessed would:

- Tend to result in the exit of existing generating capacity that would be economic at the new capacity price, but is uneconomic at the "existing" capacity price, and replace the existing capacity with higher cost imports and new capacity. Near term consumer cost reductions would turn into higher costs for future consumers.
- Tend to incent exports of existing capacity, replacing it with capacity imports that are less reliable when they are needed during periods of regional tight supply.
- Inherently result in a reduction in social welfare when lower cost existing capacity exits as a result of the lower price it receives and is replaced with higher cost new capacity.

Discriminatory capacity markets:
common issues to most/all approaches

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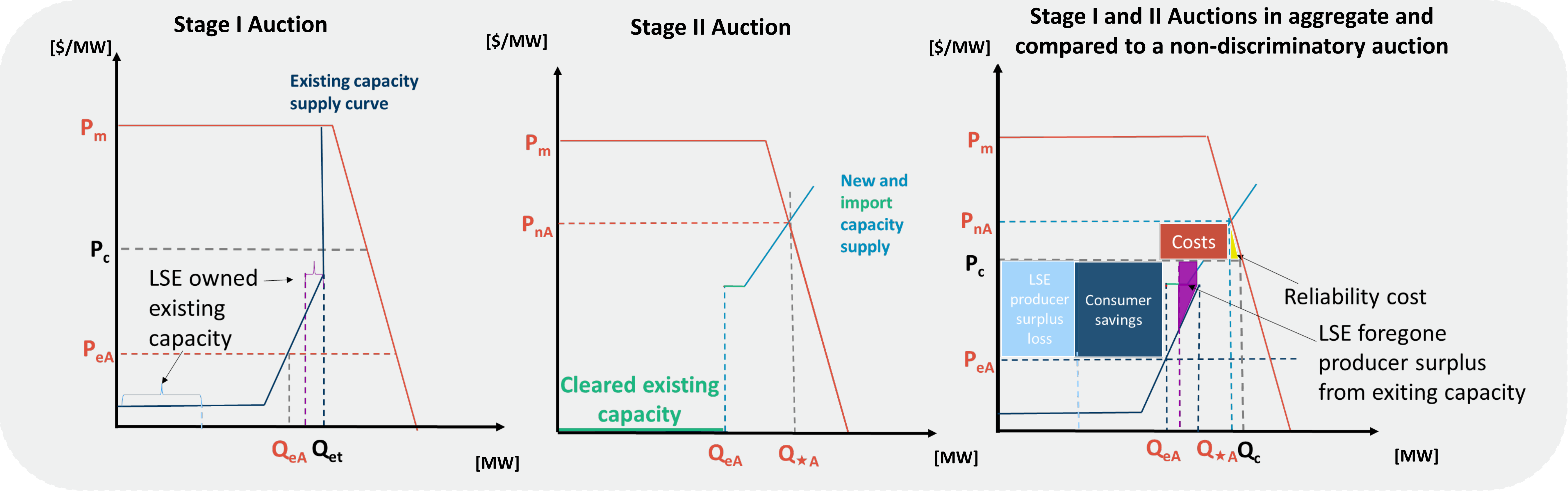
In this section we identify a number of issues that are common to most/all implementations of a discriminatory auction design

1. The short-run consumer capacity payment reductions from a discriminatory design will be smaller if some of the existing capacity is owned by or under long-term contract to LSEs. A discriminatory design could have unintended impacts on LSE owned or contracted generation.
2. A discriminatory auction design would complicate LSE forward hedging and the NYISO administration of capacity auctions.
3. A discriminatory auction design would complicate New York state procurement of new capacity.
4. The capacity price required to incent entry will be higher under a discriminatory design because investors in new capacity will recognize that one day they would be treated as old capacity.
5. A discriminatory auction design will impact investment choices: it will tend to bias procurement outcomes towards short-lived capacity, even if short-lived capacity is higher cost.
6. Capacity market performance incentives would be weakened by a discriminatory capacity market design.
7. A lower discriminatory price for existing capacity can result in capacity prematurely shutting down even when much higher future capacity prices are expected.

Short-run reductions in consumer costs from a discriminatory auction design will be smaller if some of the existing capacity is owned by or under long-term contract to LSEs

SCENARIO A: low going-forward costs of existing capacity, low offer prices from additional new capacity



- There would be no consumer cost savings on the existing capacity of LSEs that remains in operation (light blue area). There also could be unintended impacts on the operation of high cost capacity owned by LSEs.

LSE Forward Hedging

A discriminatory auction design would complicate LSE hedging and NYISO administration.

- If the NYISO did not distinguish between new and existing capacity in forward auctions or in bilaterally purchased capacity in settling the spot auction, suppliers of existing capacity could circumvent the discriminatory market simply by selling their capacity in forward auctions or through bilateral contracts (where they would receive higher capacity prices than in the spot auction for existing capacity).
- Hence, the NYISO, LSEs, suppliers and exchanges would need to distinguish between "new" and "existing" capacity in every transaction and every auction.
- Spot auction LSE obligations would need to be defined in other than MW terms, because the spot auction would necessarily clear two types of capacity at different prices.

LSE Forward Hedging (cont.)

There is more than one way to define spot auction LSE obligations in a way consistent with the discriminatory market, but we believe workable designs would need to define LSE spot auction obligations based on a MW amount times a weighted average capacity price, or something that is mathematically equivalent, in order to sustain the price discrimination. Such a design would imply that:

- How well an LSE was hedged with its forward contracts and capacity ownership would not only depend on the amount of capacity in the LSE hedge, but also on the relative amount of new and old capacity in the hedge, relative to the amount of new and existing capacity clearing in the spot auction, and the magnitude of the price difference between new and old capacity in the spot auction.
- The strip and monthly auctions would need to be cleared separately for new and existing capacity, because they would have different values in meeting LSE obligations.

LSE Forward Hedging (cont.)

- Both bilateral contracts and exchange settled contracts would need to specify whether they were for new or “existing” capacity.
- Even contracts for new capacity would need to specify a distinct contract price when the resource becomes “existing” capacity.

LSE Forward Hedging (cont.)

We illustrate such a design for a discriminatory capacity auction and LSE settlements with a simple example.

- Suppose that 85% of the capacity cleared in the spot auction is existing capacity, the clearing price of “existing” capacity is $2,000/MW and the clearing price of “new” capacity is $6,000/MW. The weighted average cost of capacity would be $2,600/MW.
- Suppose that a particular LSE’s MW obligation based on IRM and LCR was 700MW, so its spot auction obligation was $1,820,000.
- If the LSE had hedged its obligation by purchasing 700MW of capacity, 95% of which was existing, its weighted average value based on spot auction prices would be $2,200/MW and the total value of the hedge would be $1,540,000, so it would owe $280,000.
- If the LSE had hedged its obligation by purchasing 700MW of capacity, 75% of which was existing capacity, its weighted average value based on spot auction prices would be $3,000/MW, and that total value of the hedge would be $2,100,000, so it would be paid $280,000.

LSE Forward Hedging (cont.)

The magnitude of this situation could be amplified if the differences in new and existing capacity prices increased.

- Higher new and existing capacity prices, for example $8,000/MW and $3,000/MW respectively, would raise the potential pay or owe amount with the same 700MW obligation.

	Initial Example			Higher Prices Example			Less New Capacity Example		
	Spot Auction (85%)	**LSE Hedge (95%)**	**LSE Hedge (75%)**	**Spot Auction (85%)**	**LSE Hedge (95%)**	**LSE Hedge (75%)**	**Spot Auction (90%)**	**LSE Hedge (95%)**	**LSE Hedge (85%)**
LSE Obligation (MW)	700	700	700	700	700	700	700	700	700
LSE Spot Auction Obligation ($)*(based on weighted value)*		$1,820,000	$1,820,000		$2,625,000	$2,625,000		$1,680,000	$1,680,000
% Existing	85%	95%	75%	85%	95%	75%	90%	95%	85%
Existing Clearing	$2,000	$2,000	$2,000	$3,000	$3,000	$3,000	$2,000	$2,000	$2,000
New Clearing	$6,000	$6,000	$6,000	$8,000	$8,000	$8,000	$6,000	$6,000	$6,000
Weighted cost of capacity	$2,600	$2,200	$3,000	$3,750	$3,250	$4,250	$2,400	$2,200	$2,600
Hedge Value	$1,820,000	$1,540,000	$2,100,000		$2,275,000	$2,975,000		$1,540,000	$1,820,000
Owe (Pay)		**$280,000**	**($280,000)**		**$350,000**	**($350,000)**		**$140,000**	**($140,000)**
		Owe	Pay		Owe	Pay		Owe	Pay

State Procurement

A discriminatory auction design would also impact New York state procurement of new capacity.

- Suppliers selling the capacity of new long-lived assets under fixed-price contracts would require a higher strike price than in a non-discriminatory market.
- The risk of the NYISO imposing such a design would incent developers to select the index pricing option.
  - This would shift more risk onto power consumers.
  - There would be no reduced payment by consumers to this capacity when new capacity became "existing" capacity, the NYISO payment would go down and the state payment would go up.

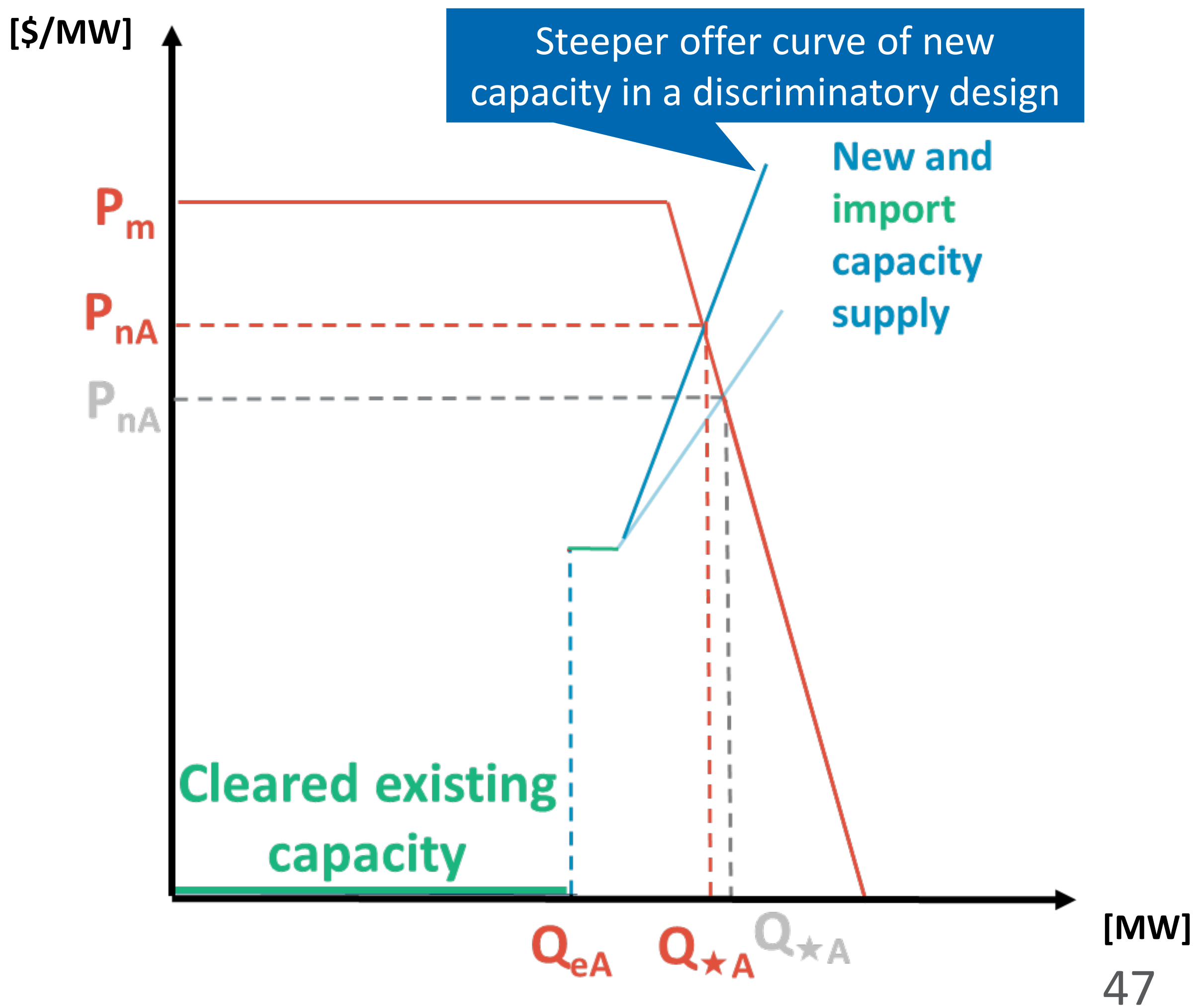
Different payments to resources with different life spans would add complexity to evaluating resource procurement offers and potentially have unintended cost increasing consequences.

The capacity price required to incent entry of new capacity will be higher under a discriminatory pricing design because potential investors in new capacity will recognize that one day they would be treated as old capacity and paid less than the market value of their capacity.

This change in expectations will occur regardless of whether there are explicit rules for "new" capacity becoming "existing capacity."

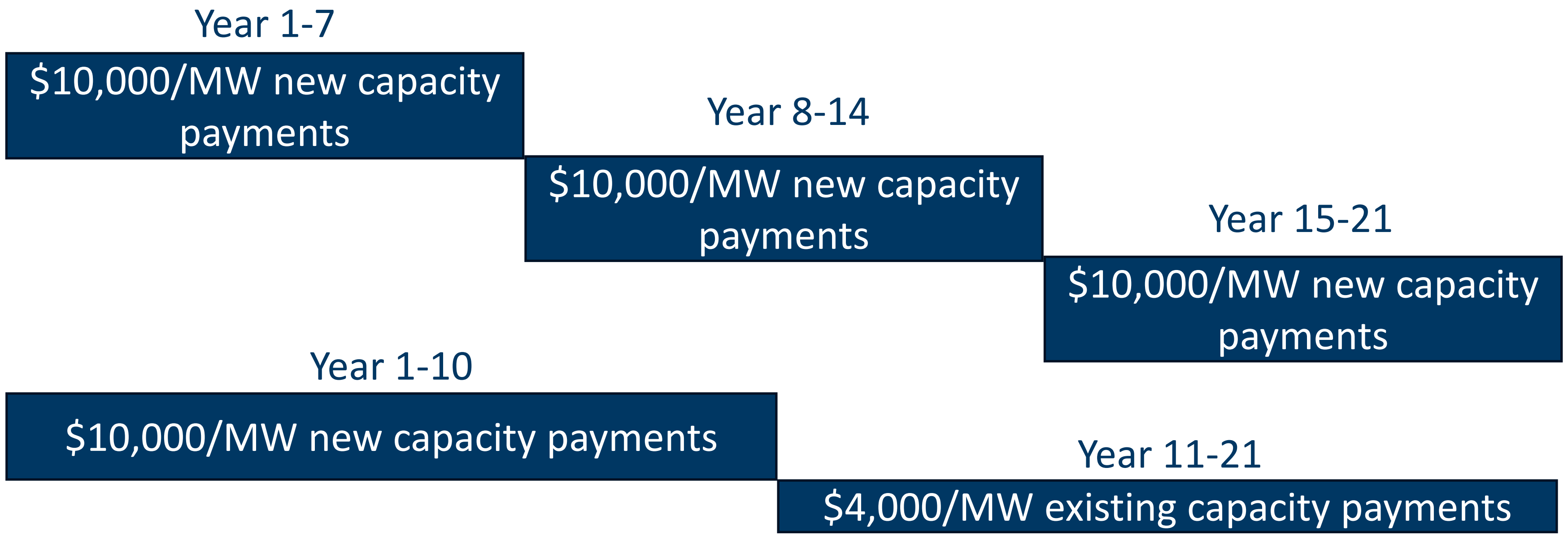
- Investors will therefore require larger expected capacity prices in the initial years in which their resource would be "new" capacity. This expectation would reduce the amount of new supply offered at a given expected future "new" capacity price.
- Hence, there is not only the risk that there may be a miscalculation of the supply of new capacity, resulting in higher-than-expected prices for new capacity, but there is also a related risk that the supply curve for new capacity would be much steeper than it would have been in a competitive market, resulting in a larger increase in the cost of new capacity.

Discriminatory Auction – Stage II Auction



Discriminatory capacity markets and investment choices

- Rules that reclassify "new" capacity as "existing" capacity after a period of years, will tend to bias procurement outcomes towards short-lived capacity, even if short-lived capacity is higher cost.
- As illustrated in the graphic below, if "new" capacity becomes "existing" capacity after 10 years, building 3 resources with 7 year lives would receive higher capacity payments ($210,000) than a resource with a 21-year life ($144,000). In the simplified example we assume that new capacity clears at $10,000/MW and existing capacity at $4,000/MW.



Discriminatory capacity markets and investment choices (cont.)

Rules that transition “new” capacity to “existing” capacity after a period of years could distort outcomes in state procurement in ways for which there is no straightforward workable solution.

- One outcome would be for the state to procure each resource type with a given resource life in a separate process to avoid the resource’s evaluation to be impacted.
- However, there might be differences in technology impacting resource life that would be hard to control for. This could adversely impact competition between technologies such as battery types. A design in which the state has to run 50 different procurement auctions and set targets for each type would not be workable or efficient.
- Another remedy for this issue might be to allow long-lived assets to be considered as “new” for a longer duration than short-lived assets, but this would introduce more complexity into the design to determine resource life and then to provide what proportion of this life should be as “new” and “existing” capacity.

How “new” and “existing” capacity might be defined when the discriminatory design is implemented would adversely impact both market and subsidized investment incentives even before the design is implemented.

Discriminatory capacity markets and investment choices (cont.)

Some discriminatory capacity markets have rules that enable "existing" capacity to become new capacity with a sufficient level of staying in business investments.

- While these rules may reduce the inefficient exit of existing capacity (i.e. they could lead some existing capacity to making staying in business investments rather than exiting), they also increase payments to existing capacity.
- Moreover, they tend to incent inefficient investment in order for existing capacity to qualify as "new capacity," incenting investment that is only economic because of the increase in price for existing capacity.
- The cost of this further reduction in market efficiency will ultimately be borne by consumers.

Rules allowing "existing " capacity to become "new" capacity would add cost and complexity to NYISO administration of the capacity market and auctions.

Performance Incentives

Investment in unit performance is mostly driven by energy and ancillary service market revenues, with some additional incentives provided by capacity market requirements and penalties.

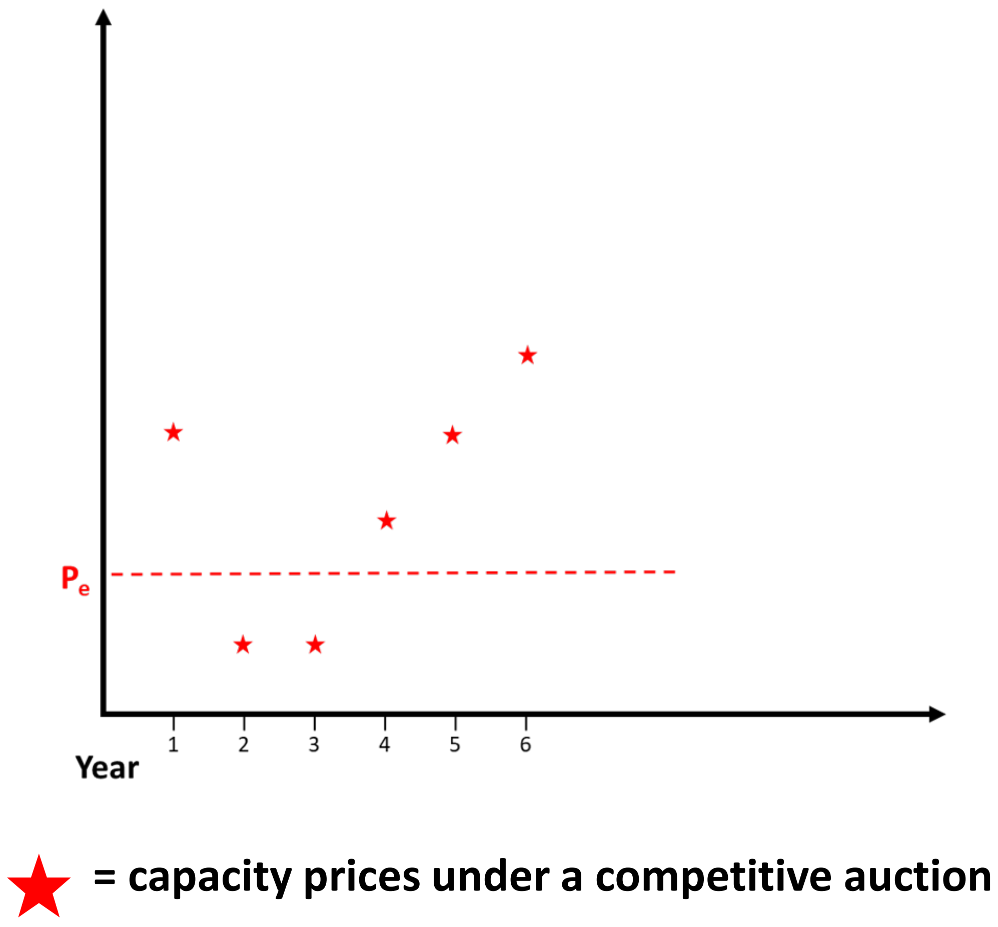
- UCAP performance incentives would be weakened by a discriminatory capacity market design because a lower price for existing capacity would reduce the value of higher resource availability.
- Firm fuel incentives would also would be weakened for existing capacity, which is the capacity these incentives are relevant for.
- Other performance incentives would need to be similarly scaled down for existing capacity to avoid having the incentives simply cause capacity to cease operation which would also add administrative complexity to the process.

A discriminatory capacity price design can also have adverse impacts for consumers if capacity prices have a variable path over time, with prices below the existing capacity cap initially but then rising over time

A price cap, or lower demand curve price, for existing capacity can result in capacity shutting down even when the price cap is not binding:

- Existing capacity with costs near the price cap would incur losses during the years when capacity prices were low, but would not receive higher prices when the capacity market tightens in the future.
- This would be less of an issue under the second discriminatory auction design, but it would still have an impact.
- These incentives could have serious adverse economic and reliability impacts on NYISO power consumers if there were supply disruptions that prevented new capacity from coming online for several years while existing capacity had shut down because it would not be economic to remain in operation through a period of low prices.

Prices under competitive auctions over time



There is a history of attempts at price discrimination between new and old producing capacity in oil and gas and the pernicious effects of these efforts

The wellhead price controls on gas, and attempts to set higher prices for new gas, had resulted in gas shortages by the winter of 1977-1978.

The Natural Gas Policy Act of 1978 attempted to price discriminate between old gas, new gas and high-cost gas. This policy ultimately resulted in inflated high-cost gas prices, open cesses and deregulation of gas in the 1980s.

The oil price regulations of the 1970’s similarly attempted to discriminate between old, new and imported oil. These regulations were terminated in early 1981, leading to falling oil prices.

These failures have been discussed in many articles and books including those listed below.

See: Argwal, V and Deacon R. “Price controls, price dispersion and the supply of refined petroleum products; Energy Economics October 1985; Bradley, R. Oil, Gas and Government Volumes I and II, 1996, Rowman & Littlefield; Breyer, S and MacAvoy, P; Energy Regulation by the Federal Power Commission, 1974, Brookings Institution; Deacon, R. "An Economic Analysis of Gasoline Price Controls," Natural Resources Journal ,October 1978; Glasner, D. Politics Prices and Petroleum, 1985, Ballinger Publishing Company; Harvey, S & Roush, C. Petroleum Product Price Regulations, Output, Efficiency and Competitive Effects, February 1981, Government Printing Office. Kalt, J. The Economics and Politics of Oil Price Regulation Federal policy in the Post-Embargo Era, 1981, The MIT Press; MacAvoy, P and Pindyck, R. Price Controls and the Natural Gas Shortage, 1975, American Enterprise Institute; Rogers, R. "The Effect of the Energy Policy and Conservation Act (EPCA) Regulation on Petroleum Product Prices, 1976-1981", Energy Journal Vol 24 #2 2003.

Discriminatory Pricing:
Real-world examples

Discriminatory pricing in capacity markets: real-world examples

In these sections we discuss discriminatory capacity pricing designs in Belgium, Spain and California.

The electricity market designs in these regions differ from that in New York in many ways other than the pricing element. A few of the significant differences include:

- Belgium and Spain have no local capacity requirements.
- The Belgian capacity market is a forward market and pay-as-bid.
- Capacity payments in Spain, which were administratively determined, have been very low compared to those in New York.
- EU capacity markets tend to be highly concentrated at the national level with limited external competition until recently.
- Resource adequacy requirements in California are generally set by the local regulatory authority. Regulated utilities have a major role in resource adequacy procurement and can be directed by the regulator to contract with generators t risk of closing down.

Discriminatory forward capacity market in Belgium

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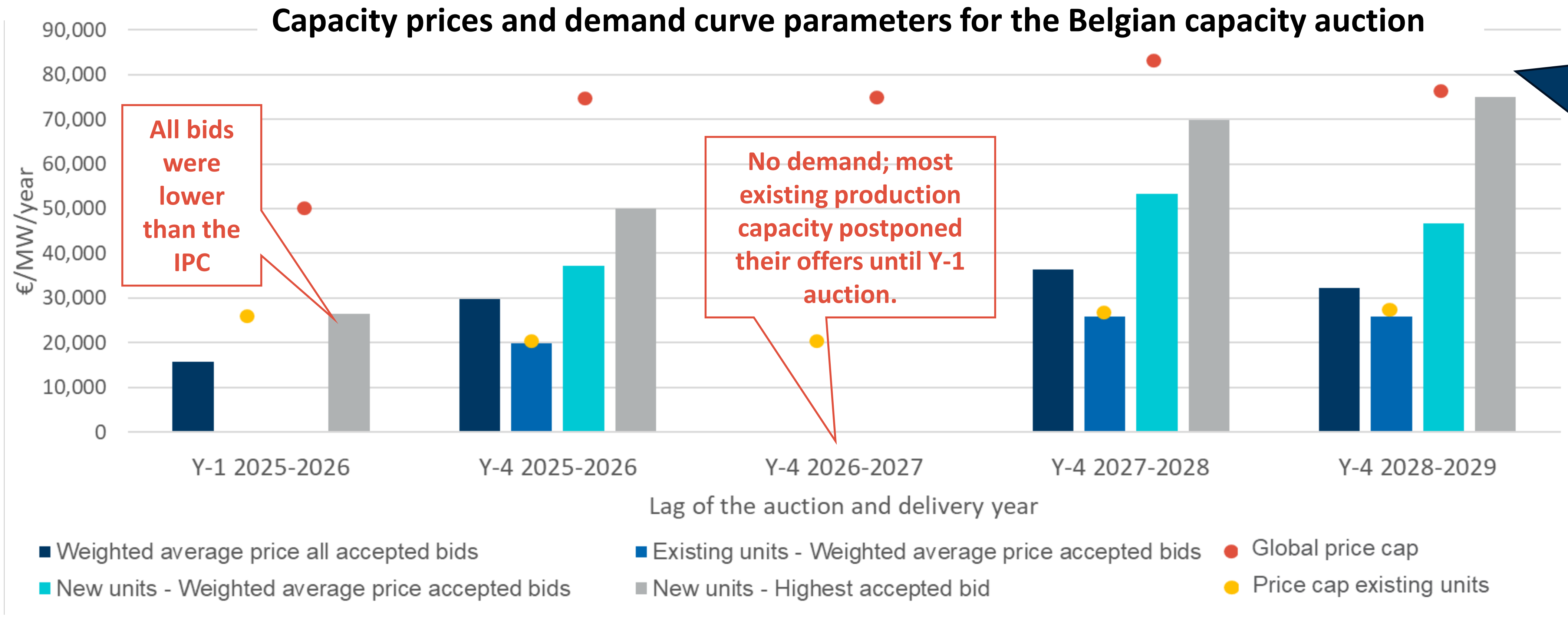
Since 2021, Belgium has had a pay-as-bid centralised capacity market with a different price cap and contract-length for existing capacity relative to new capacity

Design rationale: Attempt to reduce consumer costs during periods in which large amounts of new investment are needed to replace the large nuclear power fleet that has been phased out by the government

- Two forward auctions per delivery year: an auction four years before ("Y-4") and another auction one year before ("Y-1") delivery.
- Capacity contracts are awarded in the Y-4 forward auction with different contract lengths (from 1 year up to 15 year). The contract length in the Y-1 auction is always 1 year.
- There is a so-called intermediate price cap ("IPC") in place for existing units, which is typically 1/3 of the global price cap.[1]
- The product sold in the capacity auction are reliability options with a stop-loss feature. The strike prices are administratively set (typically between 345 and 562 USD/MWh) and can differ by technology.[2]

Notes: (1) The IPC is calculated based on "*the missing-money level of the worst performing technology class currently in the market*" calculated as the annualized routine investments + yearly fixed O&M costs – yearly energy market revenues – yearly balancing and ancillary service market revenues. (2) 320 and 520 EUR/MWh converted into USD using the exchange rate as at 25 March '25.

The weighted average price for existing capacity can be substantially lower than the weighted average price for new capacity in the Belgian capacity auction

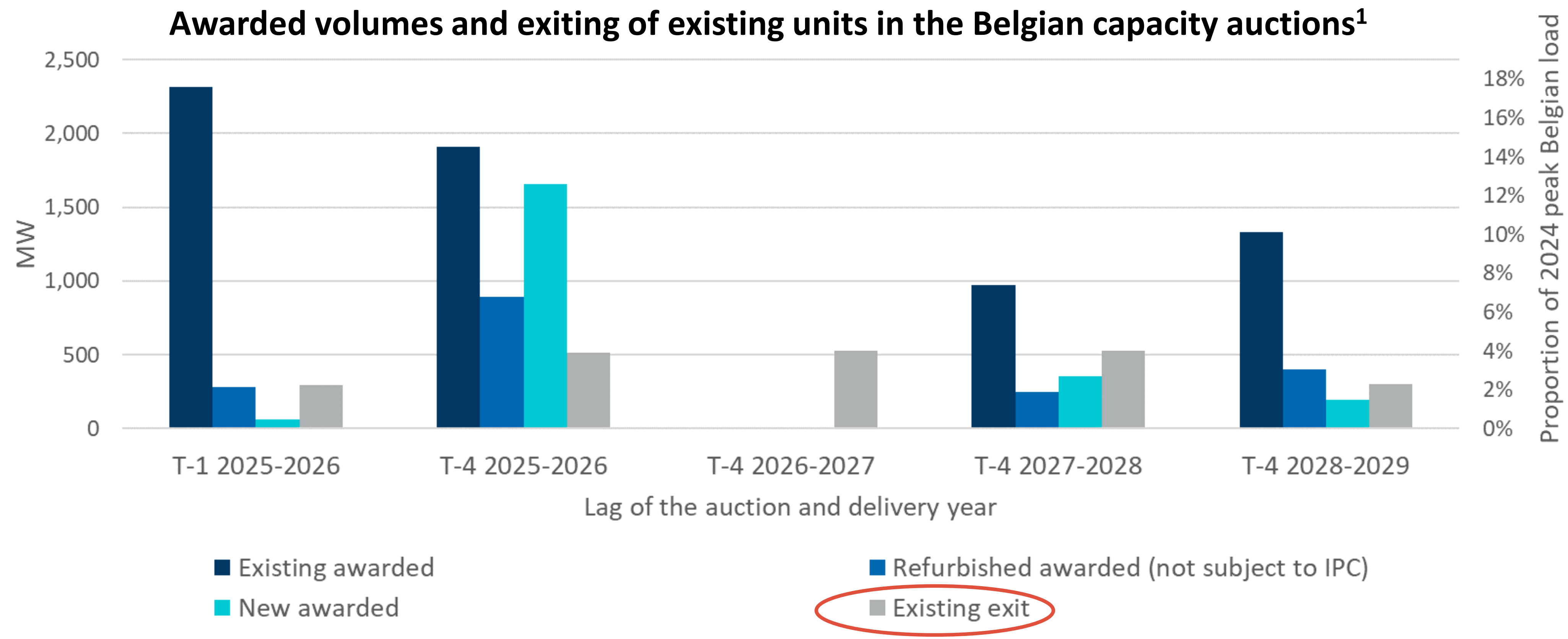


A global price cap of €75k/MW/year equals $81k/MW/year[1]

1. Due to the pay-as-bid nature of the auctions, the weighted average price of all accepted bids (first column) can be substantially lower than the most expensive accepted bid (last column).
2. Due to the price cap for existing capacity (IPC), the weighted average price for awarded existing capacity (second column) can be substantially lower than the weighted price of awarded new capacity (third column).
3. Due to the different timing of the auctions for the same delivery year, the capacity price for the same delivery year can be substantially different (Y-1 2025-2026 vs Y-4 2025-2026 auction results above).

Note: (1) Converted into USD using the exchange rate as at 25 March '25.

The price paid to new capacity compared to existing capacity has been substantially higher in most auctions, while a material amount of existing capacity has exited each year



Each Y-4 auction, between 300-530 MW of existing capacity opted out of the capacity auction and retired. For each of those auctions, the weighted average bid price of the awarded "additional" capacity was substantially higher than the weighted average bid price of awarded existing capacity (see previous slide).

The Belgian example shows that existing capacity exit is not just theoretical, it does occur and can be material.

Note: (1) According to data from the European Network for Transmission System Operators for Electricity ("ENTSO-E") the Belgian peak load in 2024 was 13,282 MW.

Awarding contracts new capacity with longer capacity contracts than existing capacity is in place in the Belgian capacity market – the higher the CAPEX of the new capacity the longer the contract

In the Belgian capacity market:

- 1-, 3-, 8- and 15-year contracts are available in the T-4 auction. The contracts awarded in the T-4 auctions that have taken place so far are shown on the right.
- Eligibility to different contract lengths is determined by predefined investment costs thresholds[1]:
  - 3-year: CAPEX is between €177/kW and €400/kW
  - 8-year: CAPEX is between €400/kW and €600/kW
  - 15-year: CAPEX is above €600/kW
- For CAPEX to be eligible, it must be necessary to make additional capacity available for the Belgian electricity system.
- For existing capacity, only CAPEX is eligible that increases the contribution of the unit to adequacy from the first delivery year onwards by:
  1. increasing the installed capacity; or,
  2. allowing for a lifetime extension.
- Non-eligible CAPEX includes investments to increase flexibility or efficiency, or to reduce emissions.

Duration of contracts awarded in the four latest Y-4 capacity market auctions in Belgium

Contract duration	2021/22	2022/23	2023/24	2024/25
1-year	62.8%	-	61.8%	89.5%
3-year	-	-	15.6%	-
8-year	-	-	-	-
15-year	37.2%	-	22.7%	10.5%

Longer capacity contracts for new capacity with similar rules are also in place in other European capacity markets such as Italy, Poland and Great Britain.

New gas-fired units and batteries won nearly all the 15-year contracts

Note: (1) The CAPEX thresholds are calculated so that the annuities (€/MW) for the different durations are the same under a chosen constant WACC.

Discriminatory capacity payments in Spain

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Spain is currently revising its capacity market design – but prior to this discriminatory capacity payments were in place from 2007 – 2018

Capacity payments for all generators were introduced in 1998.

From 2007-2018 the capacity payments were made discriminatory. Two types of payments were introduced:

- *Administratively-set Investment Payment.* Payments for typically 20 years from when the plant was built. Introduced in 2007 and eligibility was phased-out for new capacity built after 2016 but grandfathered for those that were built before and eligible.
- *Administratively-set Availability payments.* Payments introduced in 2012 and suspended in 2018.

Eligibility criteria to receive the discriminatory capacity payments:

- The Investment Payments were only available for generation built after 1998 – this discrimination was intended to reduce the costs of the capacity mechanism.
- The Availability Payments were only paid to dispatchable generation technologies.

In 2018, a CCGT received around 10 k€/MW (11.8 k$/MW) in Investment Payments and 5 k€/MW (5.9$/MW) in Availability Payments.[1]

Increased penetration of renewables (and consequent decreases in wholesale revenues) resulted in thermal power plants facing financial difficulties resulting from their potential inability to cover their going forward fixed costs.

Note: (1) Converted into USD using the average exchange rate in 2018.

Existing plants are not permitted to exit without government consent or litigation, which has resulted in legal challenge from generators – this may be posturing to make the case for payments to existing capacity

Spain rejects Endesa's request to close its Colon CCGT power plant

As the lobbying gets louder, coal power stations may not go quietly

Energy companies in Italy and Spain have faced unexpected local opposition to their own plans to shut polluting plants

Iberdrola does not plan to close combined cycle plants in Spain, chairman says

April 24, 2024 at 04:47 am EDT

Naturgy gets top Spanish court's nod to mothball gas plants

Tarragona: The first gas-fired power plant sold off in pieces due to lack of demand

Thermal plants are not permitted to exit the market without permission from the government

Even though Naturgy had the right to close the CCGTs, so far, they have not closed them. The same is true for Iberdrola. This failure to close the plants suggests that **perhaps the retirement notices were strategic, intending to get the government to provide capacity payments** even though the plants were economic.

So far only one CCGT plant closed (in 2018). This CCGT was operational for less than fifteen years.

The proposed new capacity market in Spain will operate via a set of auctions to address the supply concerns the country is currently facing

Currently, Spain was facing supply crunches in the short term:

1. **CCGTs** remains the marginal technology, and most plants have been barely recovering their forward-going fixed costs.
2. **Battery energy storage systems** installed remains limited.
3. **Nuclear fleet** (7 GW) is expected to gradually commence decommissioning.
4. **Hydropower Dependence & Droughts** – High risks for significant droughts reducing hydropower generation, which is a key part of Spain's electricity mix, raising concerns about energy adequacy.
5. **Coal exit** – In 2018, nearly 15% of all electricity consumed in Spain came from coal-fired thermal stations while in 2024 1.1% of power was generated from coal. Spain aims to phase out coal by 2030.
6. **Low levels of interconnection** to other countries (France, Portugal and Morocco).

A new Spanish capacity mechanism has been proposed by the Ministry of Energy. The design was under public consultation until the end of January 2025.

Capacity prices would be set by auctions, specifically:

- Within the same annual "main" auction, existing and new units would be competing in the auction but contracts with different durations will be in place with longer contracts only available to new units. It is proposed to have a price cap in place for existing capacity similar to Belgium.
- To address short-term adequacy concerns, there will be separate "adjustment" auctions in which only existing capacity can participate.
- The law that thermal capacity is not allowed to exit without consent from the government is currently still in place.

California ISO Resource Adequacy Pricing

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The CAISO has a discriminatory resource adequacy design in which there is no centralized auction

- New gas-fired capacity has been procured under long-term contracts approved by CPUC with costs allocated to other LSEs in the local area.
- Existing capacity is purchased by LSEs in a bilateral market in which there is no transparent price. LSEs sometimes do not procure the amount of capacity required to meet their obligations if it is too expensive.
- For many years, the three investor-owned utilities believed they were able to price discriminate in the procurement of capacity.
- This price discrimination became less effective with the shift of significant load to community choice aggregators and may have contributed to the exit of gas capacity in the years leading up to the August 2020 load shedding events.
- The CPUC ultimately created a central procurement entity for local capacity.

The CAISO has a discriminatory resource adequacy design in which there is no centralized auction (cont.)

There have been constant threats by gas-fired resources to shut-down since 2011, at least in some cases, by units facing significant going-forward costs in that year, such as major maintenance.

- This has resulted in a steady stream of Reliability Must-Run (RMR) contracts and the occasional award of resource adequacy (RA) contracts at the direction of the CPUC (not all of which may be public).

RA Reports Compliance Year	Status	Capacity (MW)	2011	2012	...	2016	2017	2018	2019	2020	2021	2022	2023	2024	Last Year Output Recorded
Yuba City Energy Center	Operational	48				Retire Notice		RMR	RMR						2024
Feather River Energy Center	Operational	48				Retire Notice		RMR	RMR						2024
King City Peaking Energy Center	Operational	45				Retire Notice									2024
Wolfskill Energy	Operational	46		1		Retire Notice									2024
Sutter Energy Center	Operational	525	Retire Notice												2024
Carson Cogeneration Co.	Operational	48						Mothball Notice							2024
Fairhaven Power Co.	Not Operating	15						Mothball Notice							2020
Gilroy	Operational	120						Mothball Notice							2024
Harbor Cogeneration	Operational	100						Mothball Notice							2024
Metcalf Energy Center	Operational	580					Retire Notice	RMR							2024
Greenleaf II Cogen	Operational	39							Retire Notice	RMR	RMR	RMR	RMR		2024
Channel Islands Power	Operational	28								Retire Notice & RMR (May+)	RMR	RMR			N/A
Midway Sunset Cogen	Operational	248								Retire Notice	RMR	RMR			2024
Dynegy Oakland	Operational	110				RMR	RMR	RMR	RMR	RMR	RMR	RMR	RMR		2024
Kingsburg Cogen	Operational	35								Retire Notice	RMR (May+)	RMR			2024
E.F. Oxnard	Operational	35								Retire Notice & RMR (Jun+)	2				2024
Agnews Cogeneration	Operational	29										Retire/ Repower Notice			2023

Legend
RA Contract

Notes

1) Resource Adequacy (RA) contract data before 2018 unavailable, but Sutter's contract was ordered by the CPUC to keep the unit online through 2012.

2) E.F. Oxnard's RMR was only for one summer while it transferred from PURPA Qualifying Facility (QF) to CAISO Market Participant) MP status.

The CAISO has a discriminatory resource adequacy design in which there is no centralized auction (cont.)

The lack of assurance of a competitive market price for existing capacity likely contributed to the exit of some gas-fired capacity prior to the 2020 load shedding events and may also have resulted in resources contracting with LSEs in adjacent regions.

- However, the large amount of gas-fired capacity exiting the market since 2013 was not just a result of price discrimination in capacity procurement, it was also a result of market forces:
  - the amount of intermittent resource output and more recently storage has increased;
  - the cost of complying with once through cooling regulations increased;
  - the capacity requirement was not adjusted for changing system conditions and resource mix.
- Nevertheless, there have been unintended outcomes such as the shutdown of low-emission combined cycles and quick-start units, while very old, very very slow-starting once-through-cooling units have remained in operation.
- Issues have also had to be addressed with respect to procurement of phantom external RA.

California Gas Plant Retirements

More than 10,000 MW of natural gas fired generation shut down in California between 2013 and 2020.

- A significant portion of this capacity shut down to comply with once through-cooling regulations rather than making necessary investments to change plant operations.
- Smaller amounts of capacity have shut down permanently since the August 2020 load shedding events.
- The large unit shutting down in 2023 was a once-through-cooling unit whose shutdown had been extended from 2020 to 2023.

Year	Gas Retired (Actual MW)
2013	1,009
2014	666
2015	971
2016	299
2017	3,508
2018	2,244
2019	620
2020	1,454
2021	2
2022	29
2023	854
2024	34
2013-2024	**11,689**

Sources: CAISO Announced Resource Retirement and Mothball List (November 2024), CA Power Plant Cross Reference, 2018 RA Contract List, S&P CapIQ, CAISO 2017 SOM.

California Once-Through-Cooling Plant Retirements

Since 2020, three natural gas plants scheduled to retire in 2020 have had their shutdown extended through 2026 and one through 2029. This happened in two steps:

1. Four natural gas plants scheduled to retire December 2020 were kept online through 2023 and three through 2024 when the State Water Resources Control Board voted to reverse a prior decision ordering the once-through-cooling plants to cease operations. In 2020, following the load shedding event, the CPUC projected capacity shortfalls for summer 2021-2023 and ordered the Water Board to extend the phase-out deadlines.
2. In 2022 a large capacity shortfall was forecast for 2025. California Assembly Bill 205 allowed three once-through-cooling plants to continue operation through 2026 and one through 2029. Redondo, which had been extended in 2020, was not further extended and retired.

Details are in the appendix

Summary

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Summary

- A discriminatory capacity auction design would adversely impact consumers in the long-run, and the long-run might not be very far off.
- It is hard to envision how such a design could benefit power consumers on Long Island or upstate, even in the short-run because of LSE forward contracting in the case of Long Island and because of the importance of imports and exports in upstate New York.
- A transition to such a design would complicate LSE hedging and state procurement even before the design was implemented.

Summary (cont.)

- These designs would potentially have unintended consequences if applied to the existing capacity of LIPA and NYPA.
- The implementation of any type of discriminatory auction design would shift out the supply curve of new capacity, adversely impact performance incentives of existing capacity, and perhaps add material cost and complexity to NYISO administration of the capacity market and auctions.
- The three designs outlined have varying potential for unduly accelerating the exit of existing capacity and increasing the price of new capacity in different circumstances.

Appendix:
- Welfare impacts of a discriminatory capacity market
- Once-through-cooling retirements

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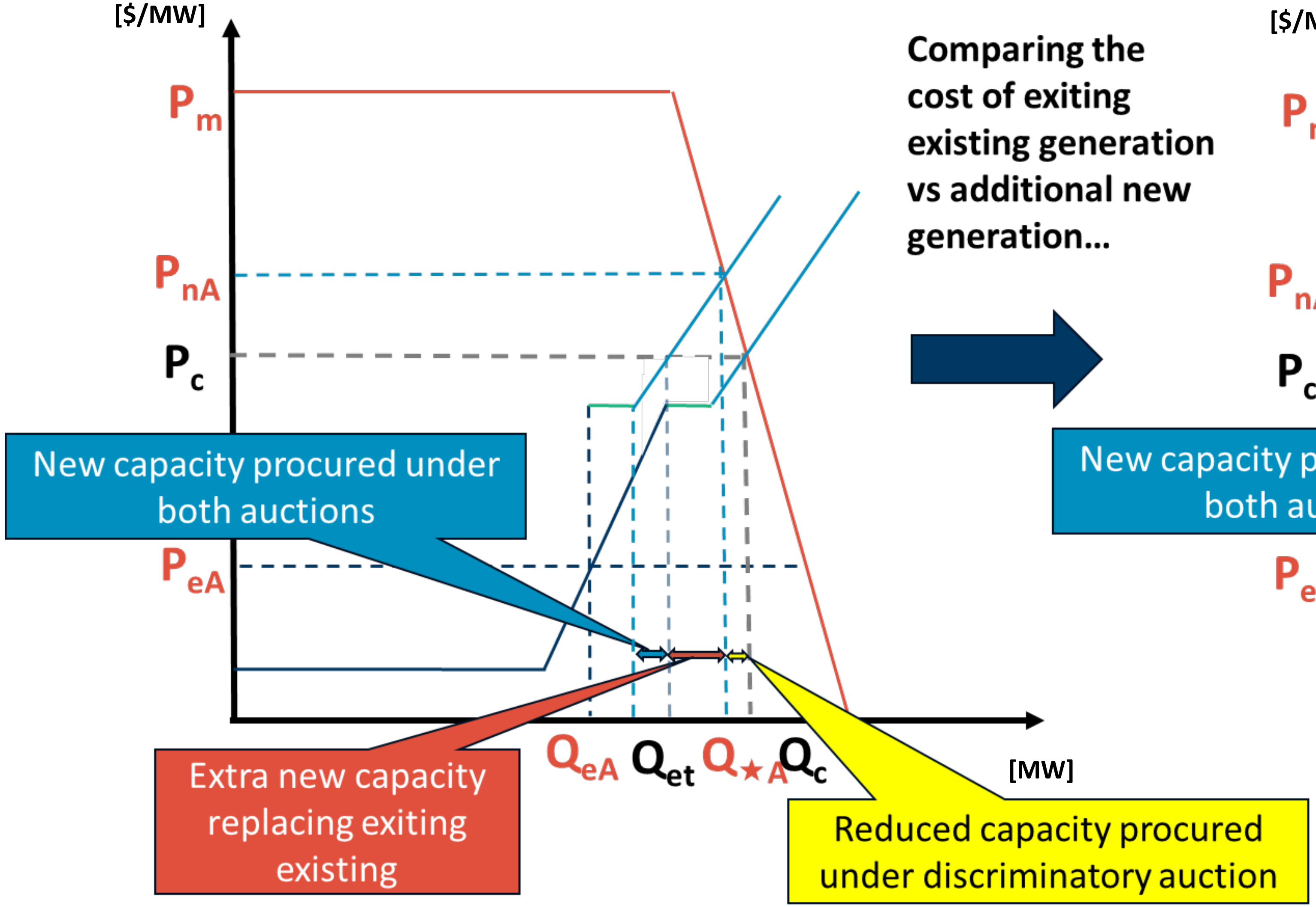
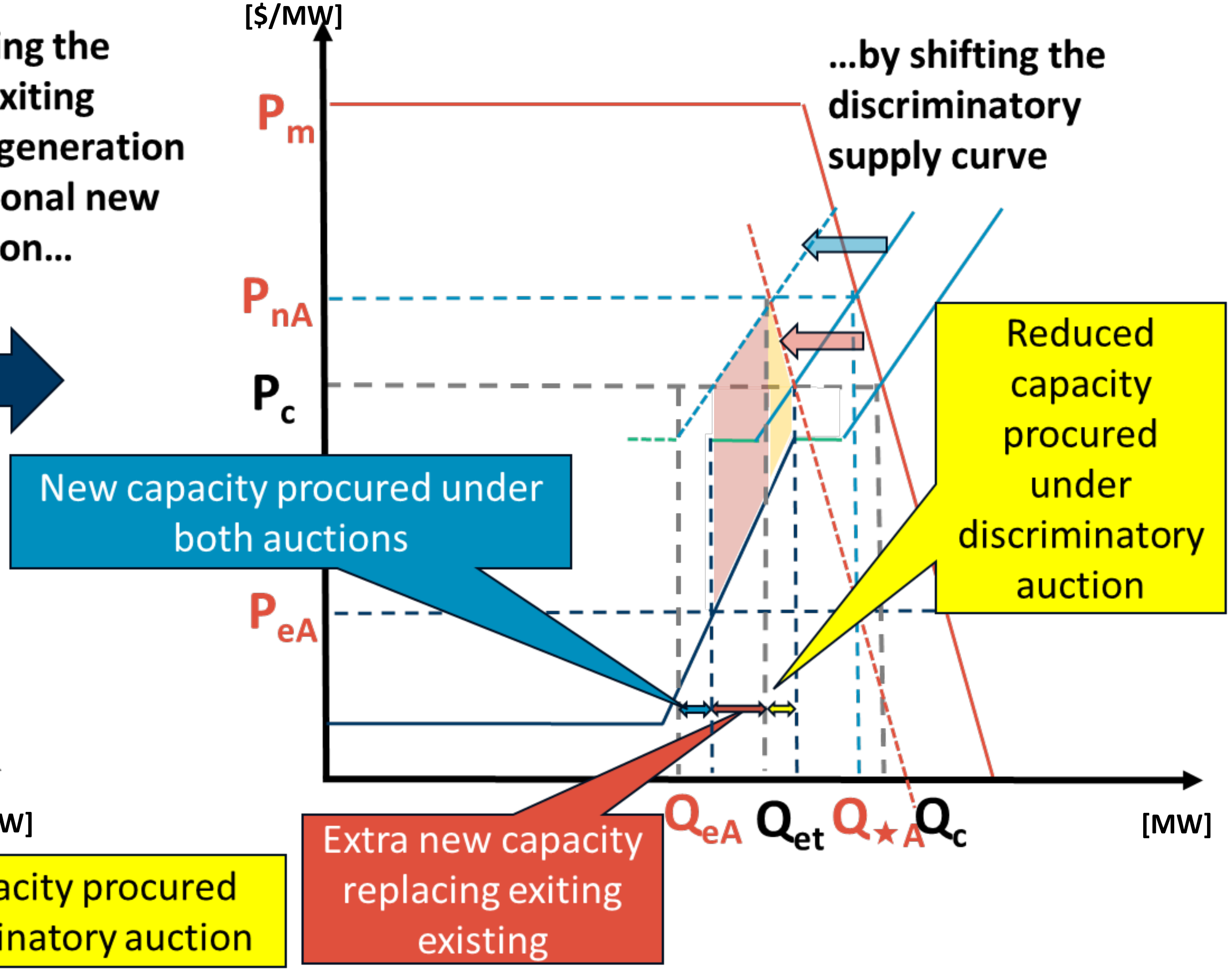
A discriminatory market will inherently result in a decrease of social welfare due to some amount of more costly new capacity replacing lower cost existing capacity that exits the market

SCENARIO A: low going forward costs of existing capacity, low price cap

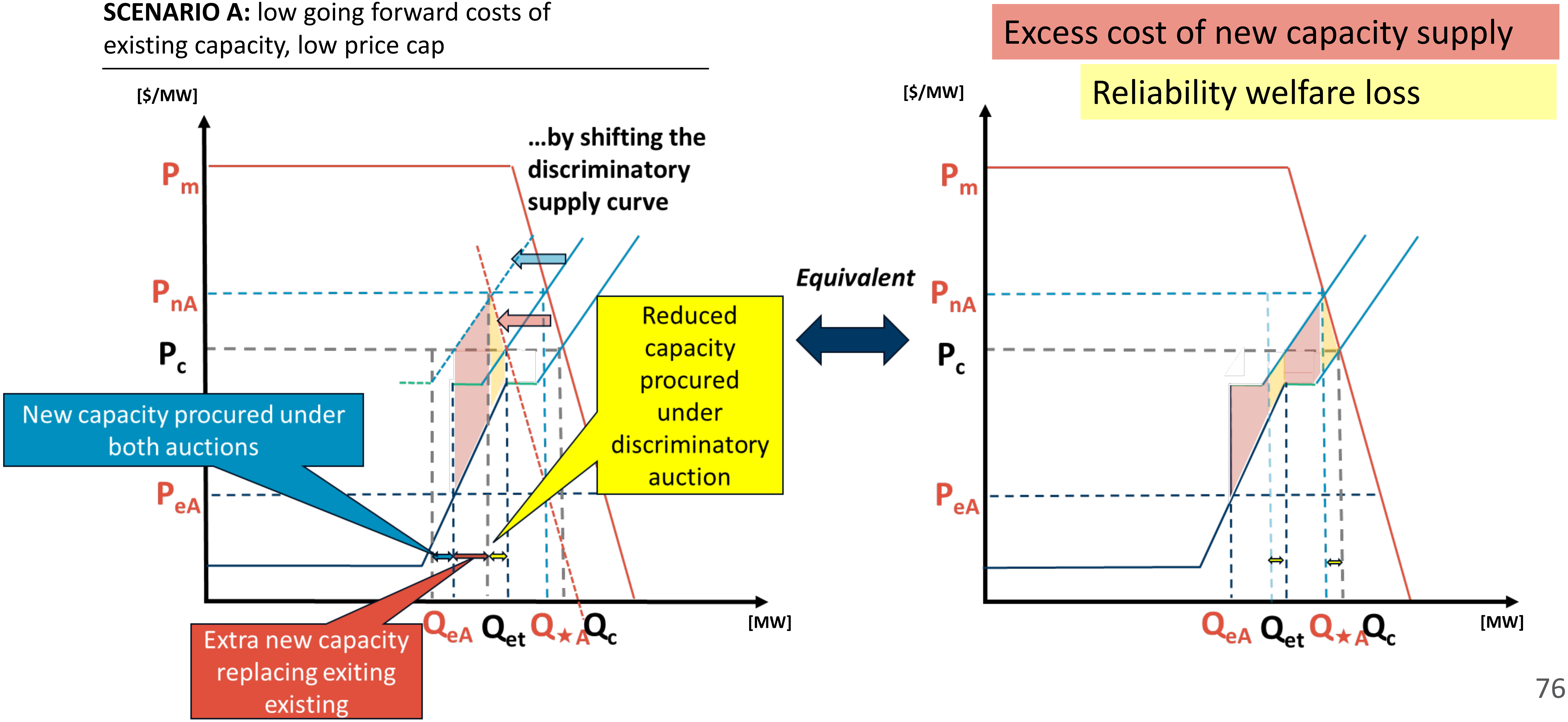


Comparing the cost of exiting existing generation vs additional new generation…



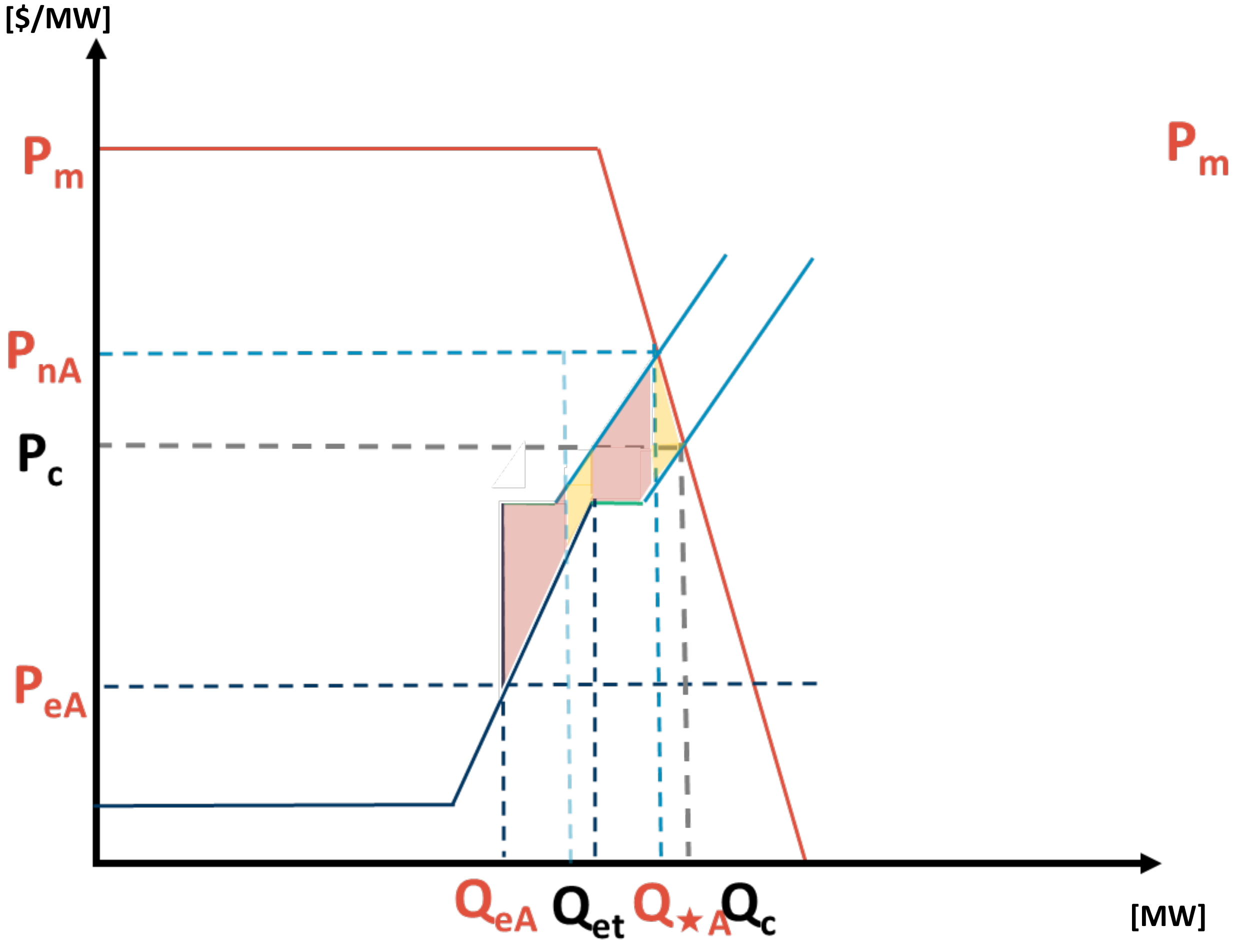
A discriminatory market will inherently result in a decrease of social welfare in all scenarios due to more costly new capacity replacing lower cost existing capacity that exits the market (cont.)

SCENARIO A: low going forward costs of existing capacity, low price cap

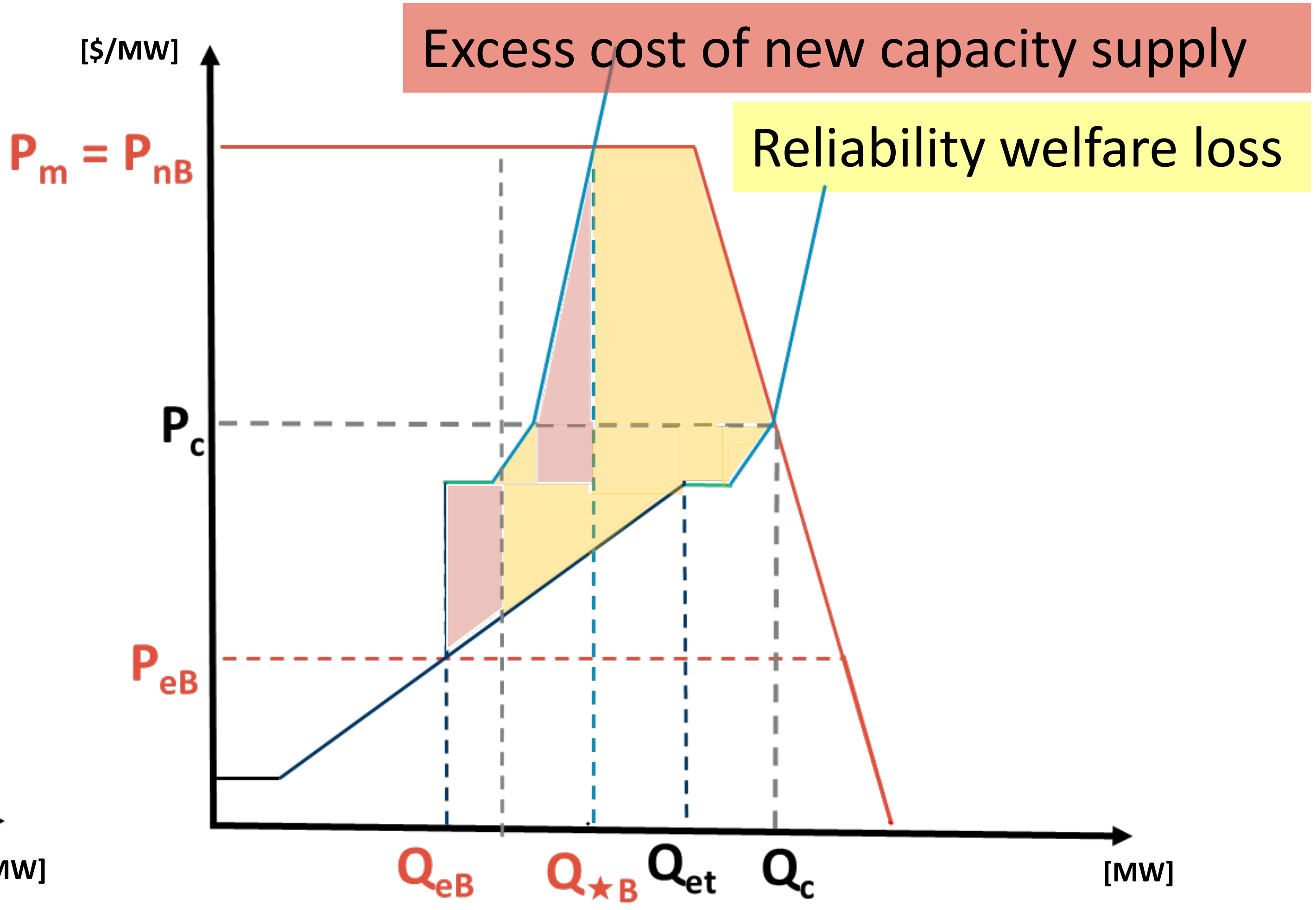


A discriminatory market will inherently result in a decrease of social welfare in all scenarios due to more costly new capacity replacing lower cost existing capacity that exits the market (cont.)

SCENARIO A: low going forward costs of existing capacity, low price cap



SCENARIO B: high going forward costs of existing capacity, high offer prices from additional new capacity



Hence, procurement of capacity in a discriminatory auction will inherently reduce social welfare relative to procurement in a competitive auction. The more uneconomic exit of existing capacity and the more costly additionally procured new capacity, the larger the reduction in social welfare.

California One Through Cooling Plant Retirements

Once through cooling retirement timelines since September 2020:

- Alamitos (1,200 MW)(AES California) – phase out extended from 2020 to 2023 to 2026.
- Huntington (250 MW)(AES California) – phase out extended from 2020 to 2023 to 2026.
- Ormond plant (1,500 MW) (GenOn) – phase out extended from 2020 to 2023 to 2026.
- Redondo (850 MW) (AES California) – phase out extended from 2020 to 2023, the plant retired at the end of 2023.
- Scattergood (350 MW)(LADWP) – phase out extended from 2020 to 202**4** to 202**9**.
- Harbor (100 MW)(LADWP) – phase out extended from 2015 to 2029.
- Haynes (1,030 MW)(LADWP) – phase out extended from 2019 to 2029.

https://www.ladwp.com/sites/default/files/documents/OTC_Study_Update_Presenation_11_15_18.PDF ; https://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/saccwis/docs/2024/saccwis_report.pdf ; https://www.rtoinsider.com/18706-otc-plants-to-remain-open-calif-water-board-rules/ ; https://www.rtoinsider.com/52446-california-energy-commission-gas-plants/ ; https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2023/rs2023-0025.pdf https://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/otc-policy-2023/otc-policy-2023.pdf ; https://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/otc_sed2010.pdf

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