

Evaluation of Sub-Annual Designs for PJM's RPM

Preliminary Assessment of Sub-Annual Capacity Market Design – Results of Quantitative Model

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Agenda

- Overview of Quantitative Analysis
- Preliminary Results of Quantitative Analysis
- Next Steps

Overview of Quantitative Analysis

Overview of Quantitative Model

Analysis designed to compare annual and sub-annual designs

- Our market simulation model illustrates and quantifies the potential impacts of moving from an annual to a sub-annual capacity market
 - The model utilizes an optimization algorithm consistent with PJM's RPM BRA algorithm, maximizing welfare given supply, demand, and CETL transmission constraints consistent with 2027/2028 BRA parameters
- We make simplifying assumptions to maintain tractability of the model, without meaningful loss of information about the differences between sub-annual and annual
- Intended to illustrate the *differences between annual and sub-annual designs*
 - The model is *not a prediction* of clearing prices or total customer payments under the current annual construct or a possible sub-annual design
- Results presented today are preliminary – our work is on-going and results may differ in report

Model Design Assumptions

Assessment to reflect current market conditions

- We model the RTO and a subset of constrained LDAs consistent with PJM Manual 18:
 - Modeled LDAs: MAAC, EMAAC, and SWMAAC (always modeled) and DOM, since its Capacity Emergency Transfer Limit (“CETL”) is less than 1.15 times its Capacity Emergency Transfer Objective (“CETO”)
- Number of periods:
 - Two sub-annual periods, reflecting summer (May 1 through October 31) and winter (November 1 through April 30)
 - The two sub-annual periods are solved independently
- “Base” scenario
 - Base scenario is one potential scenario – not intended to represent a preferred, most likely, or most relevant scenario
 - Base scenario assumes current market information with certain adjustments to balance supply and demand
 - VRR demand curves are assumed in Base scenario; MRI curves considered as sensitivity
 - Alternative scenarios also considered

Sub-annual Design Benefits

Quantitative analysis incorporates some, but not all, potential benefits of a sub-annual design

Many features and impacts of sub-annual market accounted for:

- Sub-annual market features
 - Sub-annual demand and value of capacity
 - Sub-annual resource supply quantity – i.e., accreditation and ELCC/UCAP
 - Sub-annual resource supply prices – i.e., going forward costs
- Accounting for seasonal (winter) resource performance for thermal resources
- Accounting for seasonal transmission system performance (summer/winter CETL values)

Estimated effects reflect current market conditions and/or approximation of future adjustments

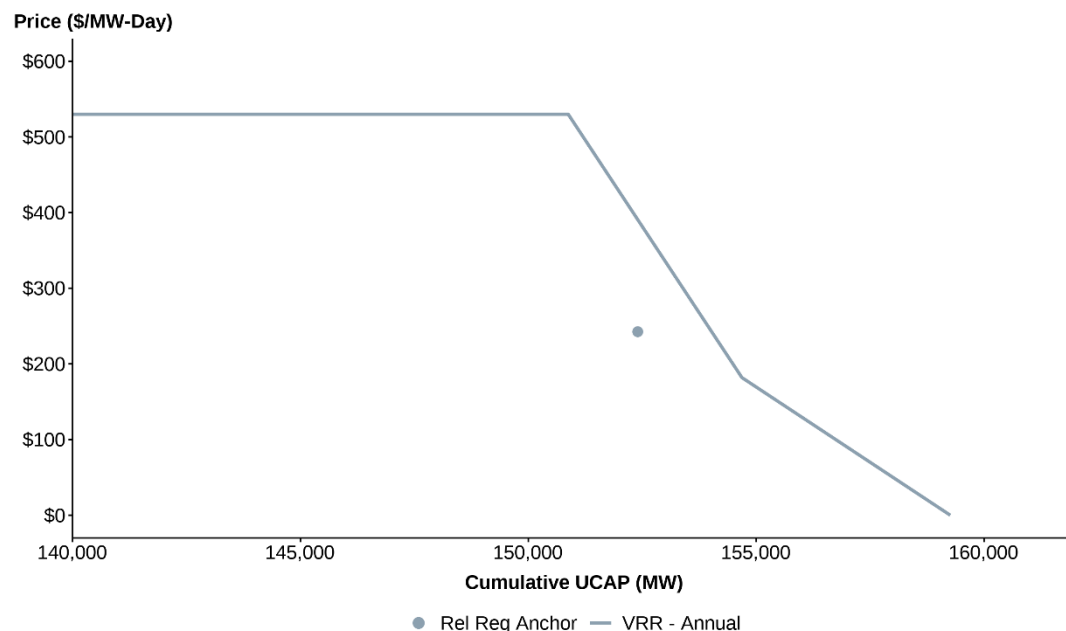
Some features and impacts not accounted for:

- No consideration of potential increase in resource supply from highly seasonal resources due to constraints of “matching” (e.g., summer-only DR, wind resources)
- Does not explore outcomes under seasonal resource adequacy risk profiles that differ from current system conditions (e.g., more EUE in the summer relative to the winter)

Annual Demand Curves

Annual VRR Reflects Current Market Rules

VRR Annual Demand Curve with Anchor Point



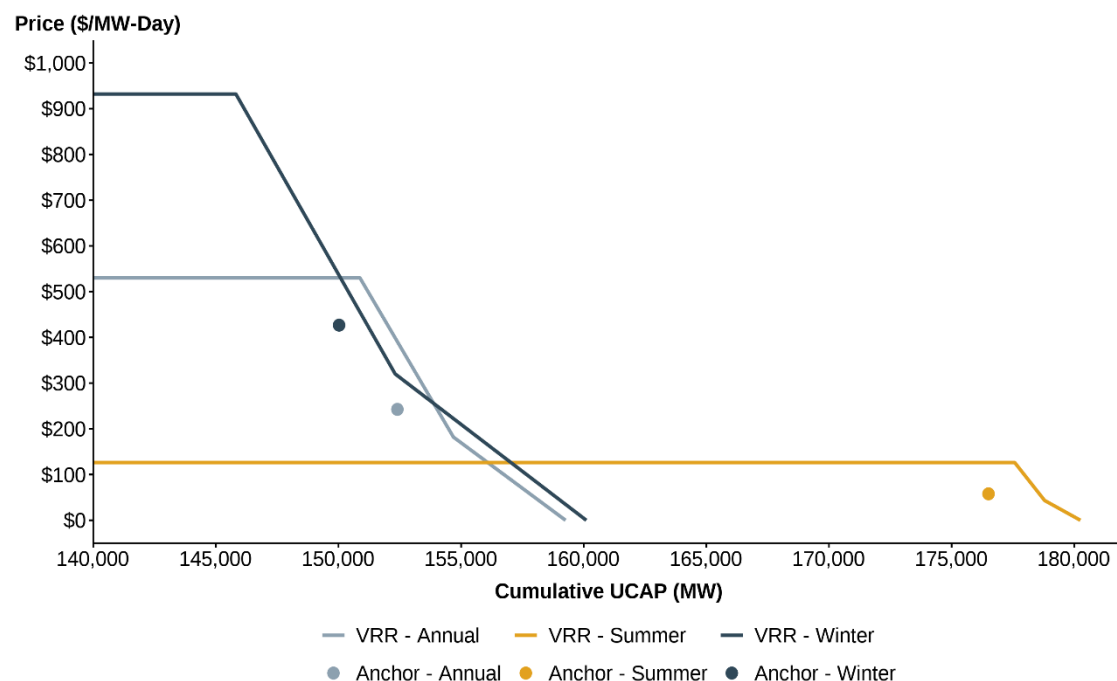
Annual VRR Provides the Benchmark for Sub-Annual Market Performance

- Annual VRR demand curves anchored at reliability requirement and Net CONE of reference technology
 - Reliability requirement reflects forecasted peak annual load in UCAP terms and reserve margin required for annual 1-in-10 LOLE reliability (152,400 MW UCAP)
 - Reliability requirement adjusted downward by 5 GW to reflect longer-term market conditions; current conditions (with no adjustment) evaluated as an alternative scenario
 - Net CONE = \$242.52/MW(UCAP) - Day
 - Does not reflect values now pending at FERC
- Slope/shape of curves are consistent with current market rules
 - Price Cap equal to max of (Gross CONE, $1.75 \times \text{Net CONE}$)

Summer and Winter Demand Curves Reflect Season-Specific Risks (1)

Seasonal reliability requirement and Net CONE reflect consistent economic/engineering principles

VRR Annual and Seasonal Demand Curves with Respective Anchor Points



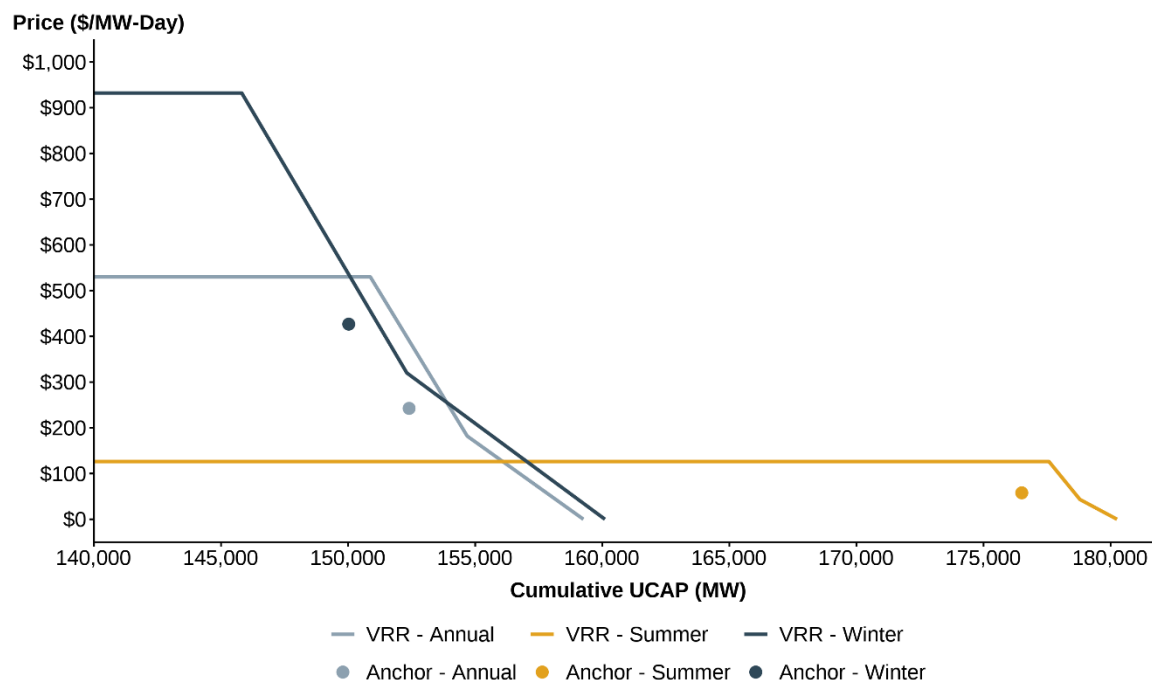
Demand curves anchored to season-specific reliability requirement and “seasonally allocated” Net CONE

- **Seasonal reliability requirements** reflect annual reliability requirement at 1-in-10 LOLE, adjusted for season-specific pool-wide accredited UCAP factor to account for different average resource capability across the fleet in each season
 - Seasonal-UCAP corresponding to annual reliability requirement is 150,024 MW in winter and 176,505 MW in summer
 - Requirements reflect existing distribution of risk across seasons
- **Net Cone “seasonally allocated”** based on share of marginal contribution to avoided EUE at annual 1-in-10 LOLE
 - Seasonal net CONE reflects (1) fixed \$ per EUE across seasons and (2) different marginal EUE in each season at the annual 1-in-10 requirement
 - At present, marginal EUE is higher in winter than summer at 1-in-10 annual requirement (0.37 v. 0.06 EUE per MW of UCAP)
 - Seasonally allocated net CONE is \$426.70 / MW(UCAP) - Day in winter and \$57.80 / MW(UCAP) - Day in summer

Summer and Winter Demand Curves Reflect Season-Specific Risks (2)

Slope/Shape and caps reflect one of many potential approaches to capture season-specific risk

VRR Annual and Seasonal Demand Curves with Respective Anchor Points

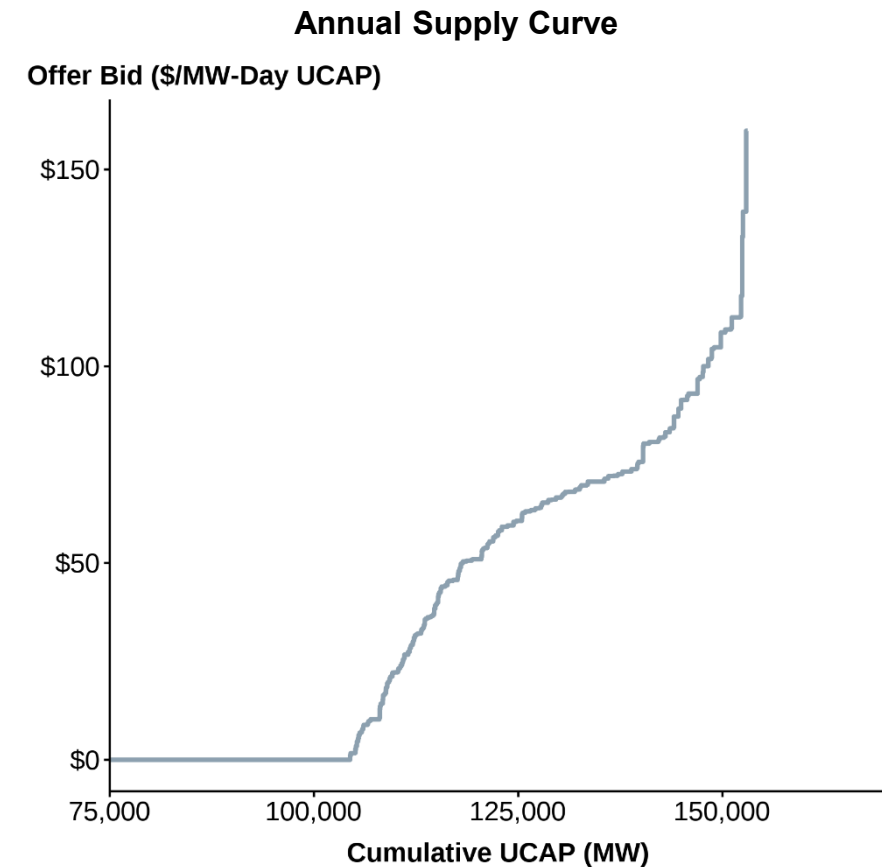


- **Slope/shape of seasonal curves** are consistent with existing annual curve
 - Preserves consistent changes in \$ per MW-day of the relevant UCAP of the period
 - Intended to maintain similar slopes between annual and sub-annual curves
- **Seasonal price caps** are proportional to “seasonally allocated” portion of gross or net CONE expected to be recovered in each season (given seasonal differences in marginal EUE at the 1-in-10 requirement)

Annual Supply Offer Curve

Supply offer curve reflects current market rules

- **Offer quantity (MW UCAP)**
 - Reflects annual ELCCs
 - $\text{UCAP (MW)} = \text{ICAP} \times \text{ELCC}$ for most resources
 - $\text{UCAP (MW)} = \text{Effective Nameplate Capacity} \times \text{ELCC}$ for intermittent resources (e.g., solar)
- **Offer Prices (\$/MW UCAP - Day)**
 - $\text{Net ACR} = \text{Gross ACR} - \text{Net E\&AS Revenues}$
 - Price per MW-day reflects UCAP
 - Lower UCAP implies a higher price, all else equal



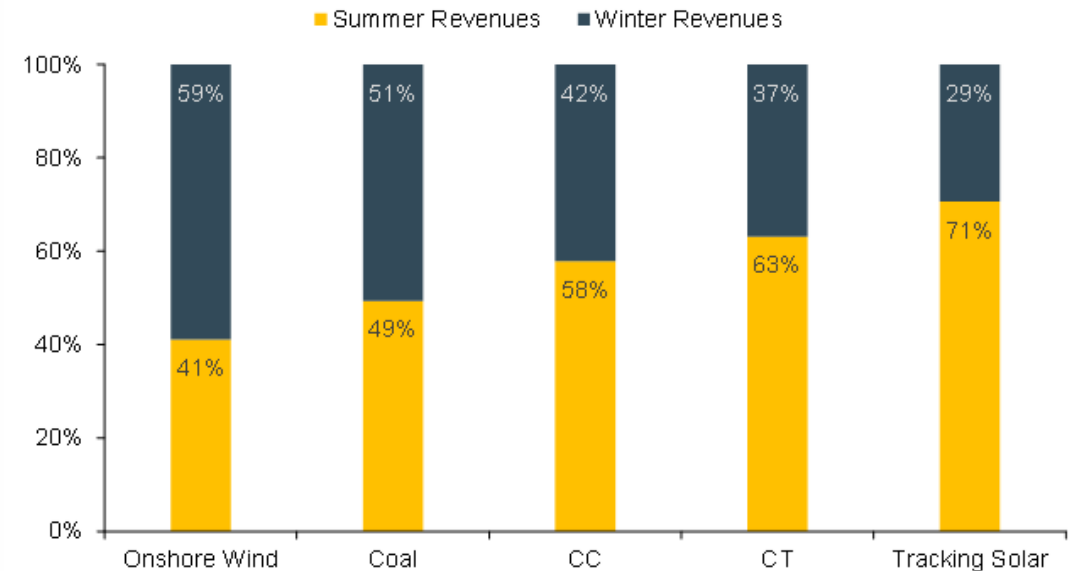
Seasonal Offers Reflect Seasonal ELCCs and Net EAS Revenues

- **Sub-annual capacity accreditation** – i.e., ELCC ratings – reflects the reliability value in each sub-annual period
- **Sub-annual net E&AS revenue** estimated specific to each period

Annual, Summer and Winter ELCC by Class Type

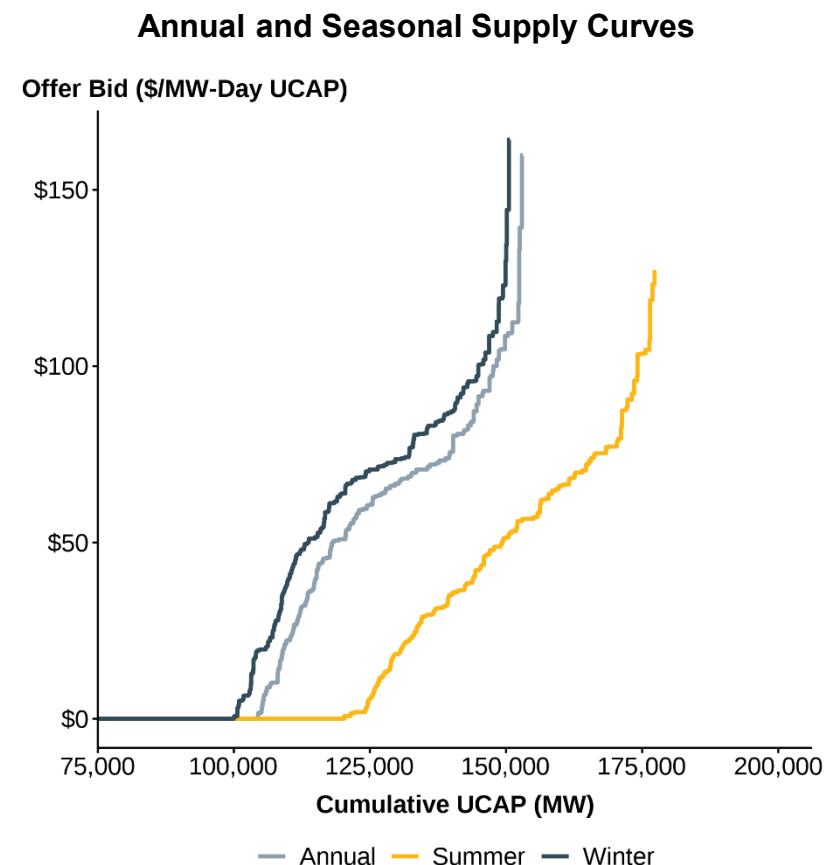
Class Type	Annual	Summer	Winter
4-hr Storage	0.58	0.94	0.54
6-hr Storage	0.67	0.98	0.63
8-hr Storage	0.70	0.93	0.67
10-hr Storage	0.78	0.97	0.76
Coal	0.83	0.87	0.83
Demand Resource	0.92	1.09	0.90
Diesel Utility	0.92	0.97	0.91
Gas Combined Cycle	0.74	0.96	0.72
Gas Combustion Turbine	0.61	0.97	0.56
Gas Combustion Turbine Dual	0.77	0.96	0.75
Hydro Intermittent	0.39	0.39	0.39
Landfill Intermittent	0.48	0.58	0.46
Nuclear	0.95	0.96	0.95
Offshore Wind	0.67	0.22	0.73
Oil Fired Combustion Turbine	0.80	0.96	0.77
Onshore Wind	0.41	0.09	0.44
Solar Fixed	0.07	0.17	0.05
Solar Tracking	0.08	0.28	0.06
Steam	0.72	0.89	0.70
Waste to Energy Steam	0.83	0.92	0.81

Share of Annual Net EAS Revenues by Season for Selected Class Types



Annual and Seasonal Supply Offers

- Sub-annual UCAP
 - UCAP reflects season-specific ELCCs
 - Summer, on average, has higher ELCCs than annual:
 - Higher ELCCs → Higher UCAP → shift supply curve to the right
 - Winter, on average, has lower ELCCs than annual:
 - Lower ELCCs → Lower UCAP → shift supply curve to the left
- Offer Prices
 - Assumes half of fixed avoidable costs (gross ACR) in each period
 - Assumes season-specific net EAS
 - Price per MW-day reflects UCAP (which varies between winter and summer) and
 - Lower UCAP implies a higher price, all else equal → shifts supply curve up
 - Lower net EAS revenues implies a higher price, all else equal → shifts supply curve up



Accounting for Winter Thermal Resource Performance

Offer curve adjusted for higher winter capacity ratings

- Current RPM ICAP ratings are based on summer performance
- Certain thermal resources, particularly CC and CT units, have higher potential ICAP ratings in the winter above their current CIR values
- To capture the potential benefits, we increase CC and CT resources' ICAP rating in the winter by 50% of the difference between their current, summer-based ICAP rating and the winter capacity reported in EIA Form 860
- We assume a partial (50%) adjustment as a simplifying assumption to account for higher winter capability in the resource adequacy and ELCC analysis

CC & CT Total ICAP (MW) and Adjusted Winter ICAP (MW)

Class Type	Total ICAP (MW)	Adjusted Winter ICAP (MW)	Additional Winter ICAP (MW)
Combined Cycle	57,391	59,018	1,627
Combustion Turbine	26,366	28,157	1,791
Total	83,757	87,175	3,418

Accounting for Winter Thermal Resource Performance (2)

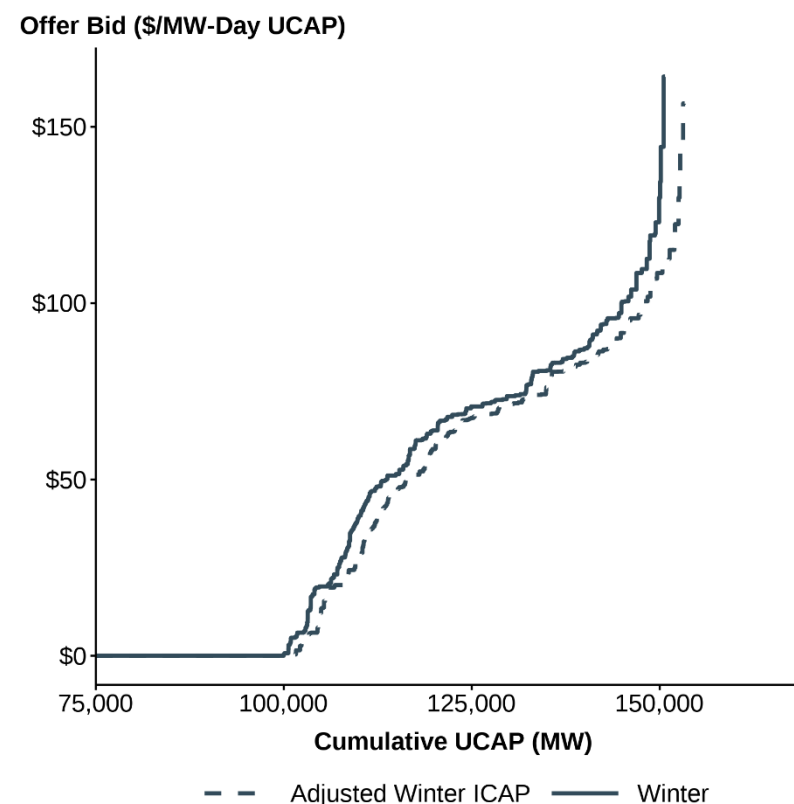
Adjustment Shifts Out Supply in Winter

Adjusting winter ICAP increases UCAP for the units with greater winter capability (i.e., CCs and CTs)

Two adjustments to offer curve:

- Larger offer quantity → shift supply curve to the right
- Higher UCAP → reduces price per MW ACR → lower offer price → shifts supply curve down

Winter Supply Curve Before and After ICAP Adjustment



Accounting for Seasonal Transmission System Performance

Differences in CETL by sub-annual period

- Current annual CETL values are summer-based → assume summer CETL equivalent to annual CETL
- Winter CETL values may differ from summer due to various factors (e.g., ambient conditions, outage rate, etc.)
- PJM and stakeholders are currently evaluating possible winter CETL values
- Differences between winter and summer zonal transmission constraints in other RTOs suggest that, on average, winter transmission capabilities are greater than summer, with large variation
- We assume that each modeled LDA will have a winter CETL value 5% greater than the annual/summer CETL

Annual and Assumed Summer and Winter CETL

LDA	Annual CETL	Summer CETL	Winter CETL
DOM	6,598	6,598	6,928
MAAC	2,598	2,598	2,728
SWMAAC	6,698	6,698	7,033
EMAAC	8,025	8,025	8,426

Preliminary Results of Quantitative Analysis

Base Scenario Outcomes with Sequential Market Clearing

Base Scenario outcomes consistent with average historical outcomes

Market Clearing: Annual and Seasonal Markets

RTO price (weighted avg.):

- Annual: \$112.43 MW-day
- Sub-annual: \$106.71/MW-day

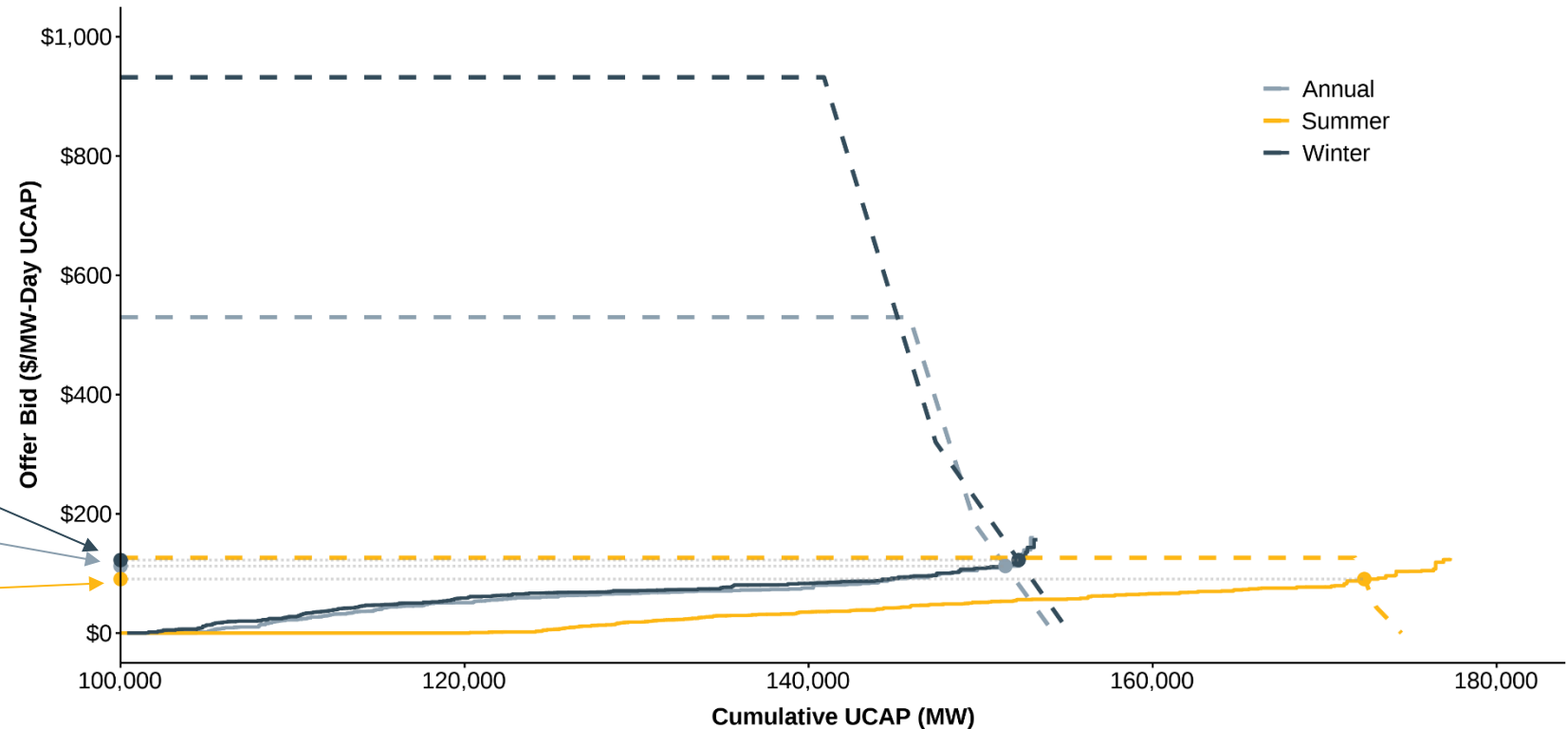
Historical:

- 2016/17-2024/25: \$85.97 MW-day
- 2016/17-2026/27: \$124.80 MW-day

Winter Clearing Price: \$122.43

Annual Clearing Price: \$112.43

Summer Clearing Price: \$91.17



Base Scenario Clearing Prices

Prices differ between seasons: in general, higher prices in season with higher risk, lower prices in season with lower risk

Annual vs. Seasonal Clearing Prices (\$/MW-Day)

LDA	Clearing Price (\$/MW-Day)
Annual	
RTO	\$112.43
Dominion	\$112.43
MAAC	\$112.43
EMAAC	\$112.43
SWMAAC	\$112.43

Annual clearing price between summer and winter sub-annual prices

LDA	Clearing Price (\$/MW-Day)
Seasonal	
<i>Summer</i>	
RTO	\$ 77.24
Dominion	\$ 92.10
MAAC	\$103.60
EMAAC	\$118.74
SWMAAC	\$103.60
UCAP-Weighted Average Price	\$ 91.17
<i>Winter</i>	
RTO	\$122.43
Dominion	\$122.43
MAAC	\$122.43
EMAAC	\$122.43
SWMAAC	\$122.43
UCAP-Weighted Average Price	\$122.43
<i>Seasonal Total</i>	
UCAP-weighted average price	\$106.71

- Prices lower in summer
- Summer prices vary with import-constrained LDAs

- Prices higher in winter
- Winter prices are uniform with no import-constrained LDAs

Base Scenario Total Payments

Payments shift between seasons, with small overall impact

Annual vs. Seasonal Capacity Payments (\$M)

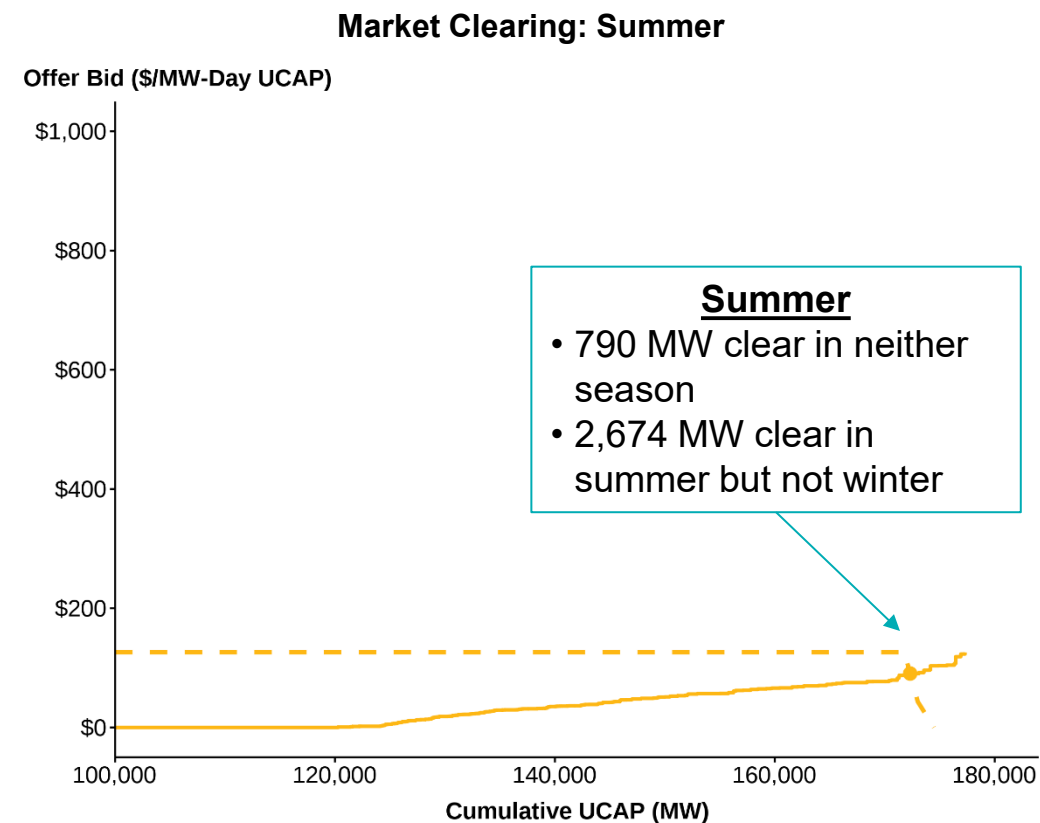
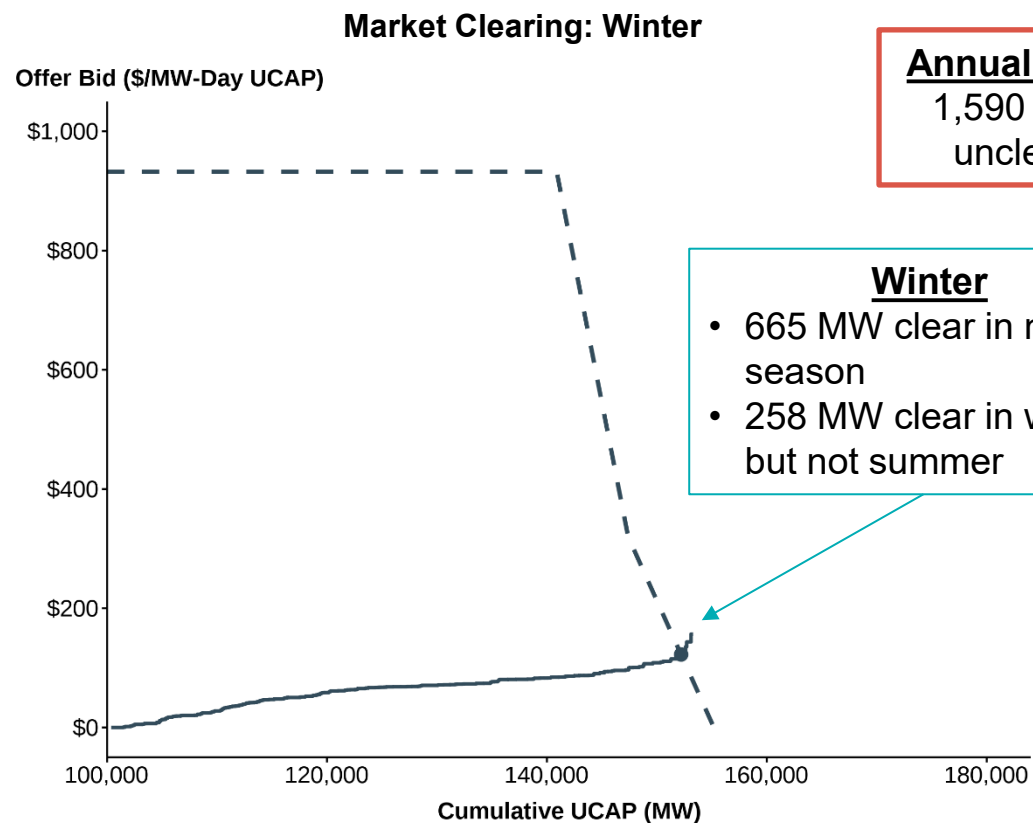
	<u>Annual</u> <u>(\$M)</u>	<u>Seasonal</u>			<u>Seasonal - Annual</u>	
		<u>Summer</u> <u>(\$M)</u>	<u>Winter</u> <u>(\$M)</u>	<u>Seasonal Total</u> <u>(\$M)</u>	<u>Absolute</u> <u>(\$M)</u>	<u>Percent</u> <u>(%)</u>
RTO	\$ 6,232	\$2,894	\$ 3,391	\$ 6,285	\$ 53	0.9%
<i>RTO (Rest of)</i>	\$ 3,192	\$1,237	\$ 1,750	\$ 2,987	-\$ 206	- 6.4%
Dominion	\$ 891	\$ 417	\$ 485	\$ 902	\$ 12	1.3%
MAAC	\$ 2,149	\$1,240	\$ 1,157	\$ 2,396	\$ 248	11.5%
<i>EMAAC</i>	\$ 977	\$ 624	\$ 525	\$ 1,149	\$ 173	17.7%
<i>SWMAAC</i>	\$ 277	\$ 149	\$ 152	\$ 301	\$ 24	8.5%

Impact of a sub-annual market:

- RTO-wide
 - Small (less than 1%) impact on customer payments
- Locationally
 - Payments decrease outside of LDAs
 - Payments increase in MAAC and Dominion

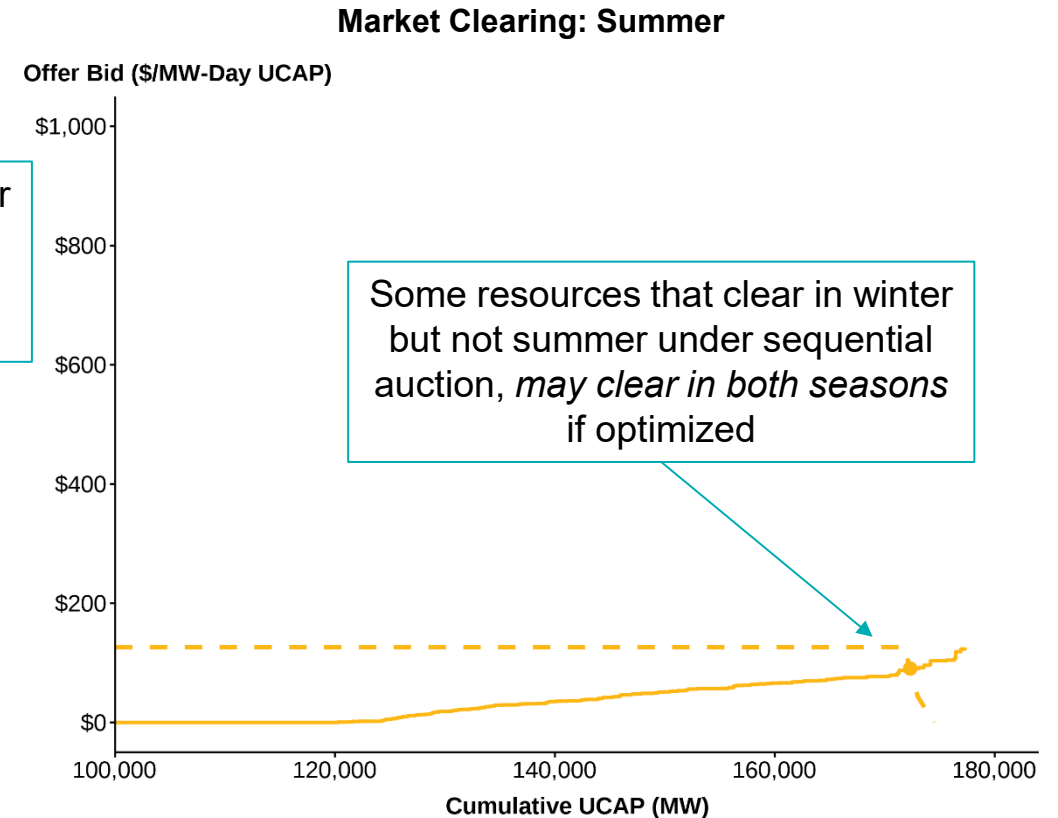
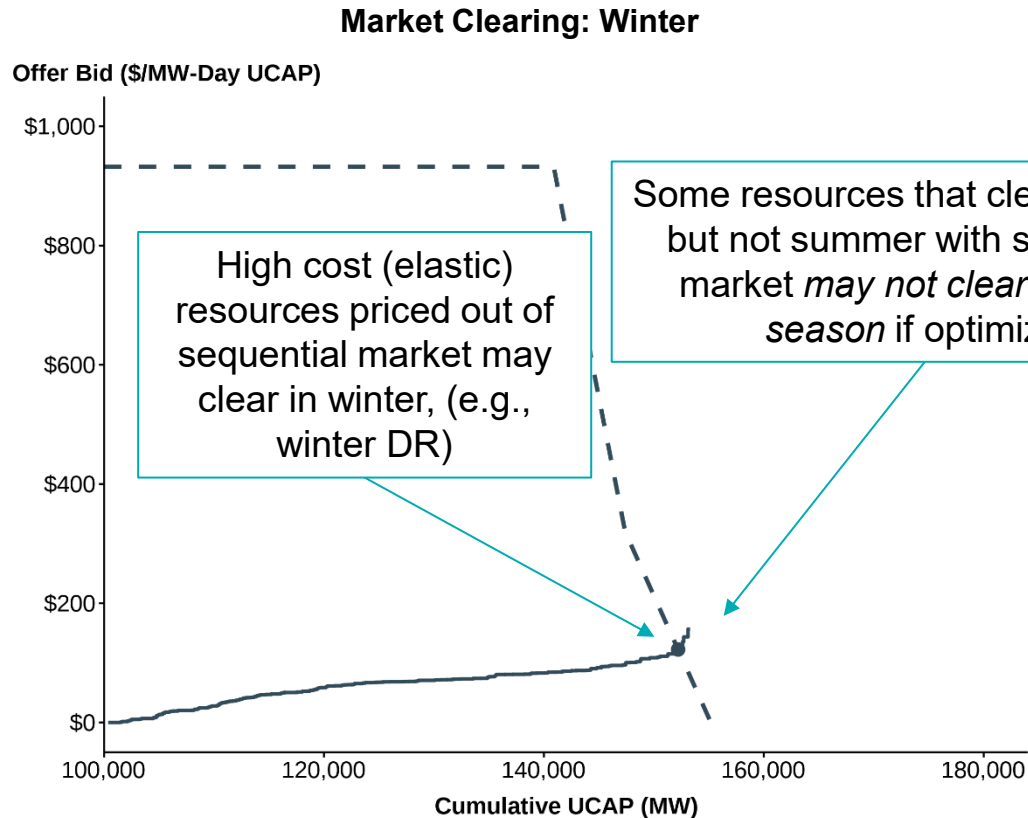
Sequential Market Clearing of Summer and Winter Supplies

Summer and winter clear supply offers (UCAP) independently



Outcomes Could Differ With Optimized Market

Optimization could cause substitutions amongst resources that clear and don't clear in sequential auction



Representative Market Scenario Production Costs

Reduction in Production Costs

Annual vs. Seasonal Production Costs (\$M)

	<u>Annual</u> <u>(\$M)</u>	<u>Seasonal</u>			<u>Seasonal - Annual</u>	
		<u>Summer</u> <u>(\$M)</u>	<u>Winter</u> <u>(\$M)</u>	<u>Seasonal Total</u> <u>(\$M)</u>	<u>Absolute</u> <u>(\$M)</u>	<u>Percent</u> <u>(%)</u>
RTO	\$1,144	\$451	\$647	\$1,098	-\$47	- 4.1%
Dominion	\$ 74	\$ 20	\$ 44	\$ 64	-\$10	-13.8%
MAAC	\$ 543	\$226	\$296	\$ 522	-\$21	- 3.9%
EMAAC	\$ 196	\$ 80	\$118	\$ 198	\$ 2	1.1%
SWMAAC	\$ 98	\$ 48	\$ 50	\$ 98	\$ 0	0.0%

- Estimated production costs reflect (short-run) going-forward costs, as accounted for in offers; does not capture long-run efficiency gains
- Production costs decrease
 - Reflects shifts in resources clearing between annual and summer/winter
 - In annual, 1,590 MW is uncleared
 - In sub-annual, 3,592 MW and 1,018 MW uncleared in summer and winter, respectively
- Production cost decrease may not represent efficiency gain because sequential clearing is not necessarily optimal
- Some resources that do not clear in summer might prefer to supply because their incremental costs (contingent on supplying in the winter) is less than their assumed offer price

Accounting for Winter Thermal Resource Performance

- Base Scenario reflects impact of accounting for higher winter performance of thermal resources
- Higher thermal winter ICAP reduces prices payments, production costs, and EUE in winter only
 - Winter clearing prices (RTO/LDAs) reduced from \$184.25/MW-day to \$122.43, reducing total payments from \$7,947 million to \$6,285 million
 - Production costs reduced from \$1,126 million to \$1,098 million
 - EUE reduced from 518 MWh to 358 MWh

Prices, Payments, Production Costs and EUE
 Sub-annual with and without Higher Winter ICAP
 No Change in Summer Outcomes

	Clearing Prices (\$/MW-Day)	Total Payments (\$ million)	Production Costs (\$ million)	EUE (MWh)
Sub-Annual (No Winter ICAP)		\$7,947M	\$1,126M	518
<i>Winter Only</i>	\$184.25	\$5,053M	\$675M	487
Sub-Annual (Winter ICAP)		\$6,285M	\$1,098M	358
<i>Winter Only</i>	\$122.43	\$3,391M	\$647M	327

Accounting for Seasonal Transmission System Performance

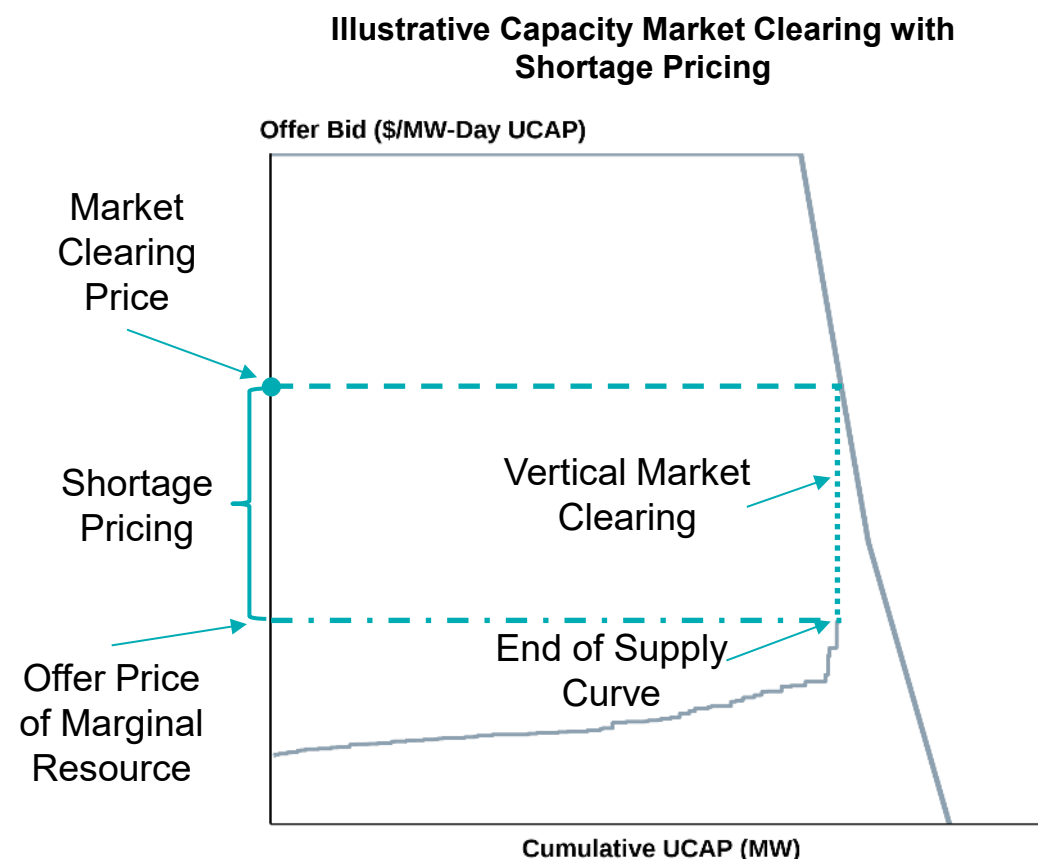
Base scenario reflects impact of improved (higher) winter CETLs

- Higher winter CETLs (above summer-based CETLs) reduce payments and production costs
 - With summer-based CETL, Dominion has a clearing price of \$137.75 / MW-day (vs. RTO price of \$122.43 / MW-day) in the winter with total seasonal payments of \$966 million
 - With higher winter CETL, Dominion is not import constrained in the winter and thus it clears at the RTO price (\$122.43 / MW-day) resulting in a lower total seasonal payments (\$902 million)
 - Seasonal production costs decrease from \$67 million to \$64 million
- If winter CETL were lower than summer-based CETL, could still increase efficiency
 - If the winter CETL is set too high (relative to its true value), the LDA may be less constrained, with prices below the efficient level
 - Thus, the lower winter CETL properly provides an incentive, via price adder, for new entry within the LDA or qualifying transmission upgrade to relieve the constraint for that season in that LDA, where such an incentive would not have existed prior

Current Market Scenario

Current Market Scenario reflects current market conditions with tighter supply

- The current capacity market is short on supply relative to the demand for capacity
- This is seen in the 2026/2027 BRA results, where virtually all offered supply cleared the market at the temporary market price cap
- Supply shortage results in market clearing at customer's willingness-to-pay (*i.e.*, the VRR curves) rather than supplier offers ("shortage pricing")



Current Market Scenario Outcomes with Sequential Market Clearing

Annual versus Two-Season

- RTO price (weighted avg.):
- Annual \$356.90/MW-day
 - Sub-annual \$226.48/MW-day

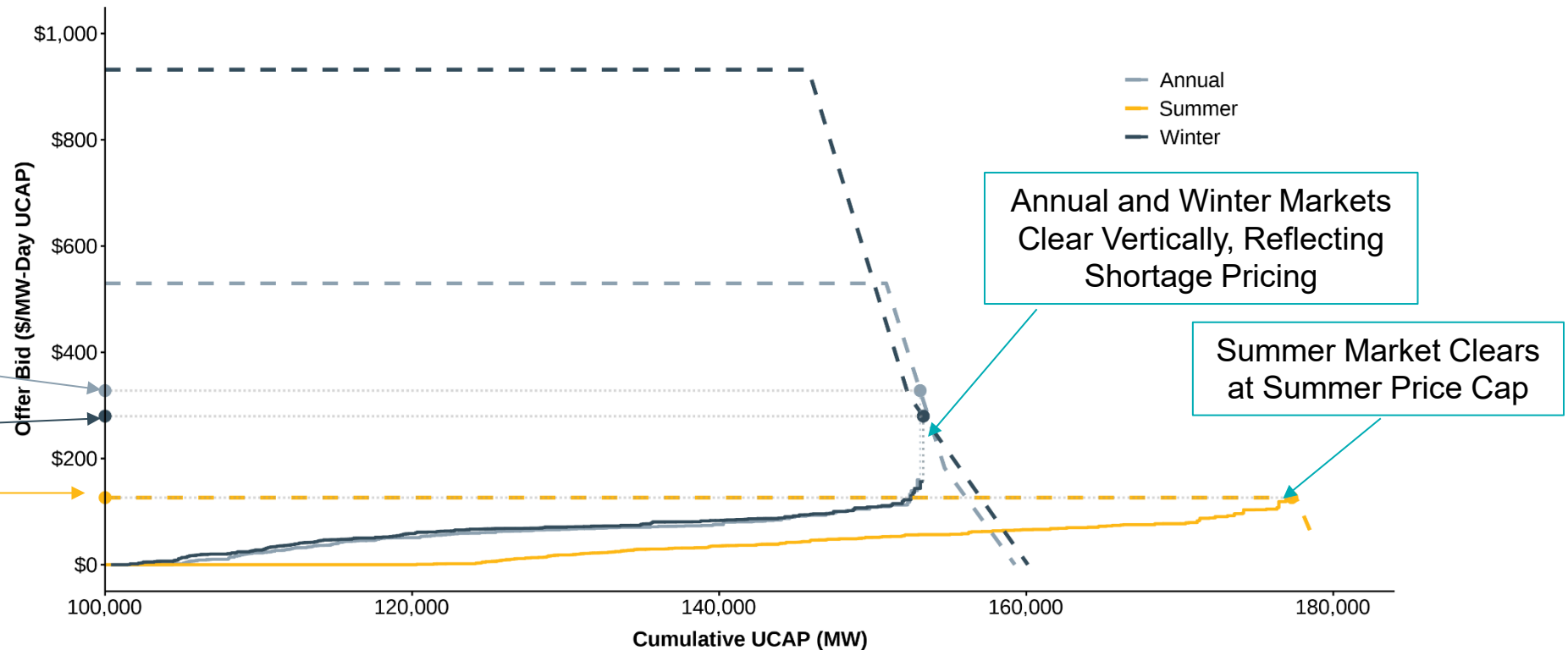
- Historical:
- 2016/17-2024/25: \$85.97/MW-day
 - 2016/17-2026/27: \$124.80/MW-day
 - 2025/26-2026/27: \$299.55/MW-day

Annual Clearing Price: \$356.90

Winter Clearing Price: \$279.75

Summer Clearing Price: \$173.78

Market Clearing: Annual and Seasonal Markets



Current Market Scenario Clearing Prices

Annual vs. Seasonal Clearing Prices (\$/MW-Day)

LDA	Clearing Price (\$/MW-Day)
Annual	
RTO	\$327.75
Dominion	\$496.00
MAAC	\$327.75
EMAAC	\$327.75
SWMAAC	\$446.25
UCAP-Weighted Average Price	\$356.90

Clearing prices vary, reflecting price adders in import-constrained LDAs of Dominion and SWMAAC

LDA	Clearing Price (\$/MW-Day)
Seasonal	
<i>Summer</i>	
RTO	\$126.27
Dominion	\$126.27
MAAC	\$260.50
EMAAC	\$260.50
SWMAAC	\$260.50
UCAP-Weighted Average Price	\$173.78

Summer prices vary, reflecting price adder in import-constrained MAAC

<i>Winter</i>	
RTO	\$279.75
Dominion	\$279.75
MAAC	\$279.75
EMAAC	\$279.75
SWMAAC	\$279.75
UCAP-Weighted Average Price	\$279.75

Winter prices are uniform, reflecting that none of the LDAs are import-constrained

<i>Seasonal Total</i>	
UCAP-Weighted average price	\$226.48

Current Market Scenario Total Payments

Sub-annual market results in large reduction in payments

Annual vs. Seasonal Capacity Payments (\$M)

	Annual (\$M)	Seasonal			Seasonal - Annual	
		Summer (\$M)	Winter (\$M)	Seasonal Total (\$M)	Absolute (\$M)	Percent (%)
RTO	\$19,998	\$5,669	\$ 7,805	\$13,474	-\$6,523	-32.6%
Dominion	\$ 3,954	\$ 588	\$ 1,115	\$ 1,704	-\$2,250	-56.9%
MAAC	\$ 6,658	\$3,008	\$ 2,691	\$ 5,699	-\$958	-14.4%
EMAAC	\$ 2,949	\$1,406	\$ 1,249	\$ 2,655	-\$294	-10.0%
SWMAAC	\$ 1,100	\$ 374	\$ 347	\$ 722	-\$378	-34.4%

- Payments lower because supply clears demand, with no prices set by shortage
- Annual construct reflects shortage pricing over entire year
- Seasonal construct has no shortage pricing in summer, but shortage pricing in winter
- Outcome reflects particular circumstances modelled (*i.e.*, risk allocation, resources, etc.)

Current Market Scenario Production Costs

No Change in Production Costs

Annual vs. Seasonal Production Costs (\$M)

	<u>Annual</u> <u>(\$M)</u>	<u>Seasonal</u>			<u>Seasonal - Annual</u>	
		<u>Summer</u> <u>(\$M)</u>	<u>Winter</u> <u>(\$M)</u>	<u>Seasonal Total</u> <u>(\$M)</u>	<u>Absolute</u> <u>(\$M)</u>	<u>Percent</u> <u>(%)</u>
RTO	\$1,224	\$549	\$675	\$1,224	\$0	0.0%
Dominion	\$ 81	\$ 33	\$ 47	\$ 81	\$0	0.0%
MAAC	\$ 587	\$267	\$320	\$ 587	\$0	0.0%
EMAAC	\$ 240	\$ 97	\$143	\$ 240	\$0	0.0%
SWMAAC	\$ 98	\$ 48	\$ 50	\$ 98	\$0	0.0%

- With resource shortage, all offered capacity clears in both annual and sub-annual markets
- With no change in cleared capacity, no change in short-run production costs

Next Steps

Next Steps

- Final Report posted on December 19, 2025
- Stakeholder presentation (report review) following the report release in January

Thank You

Contact

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Appendix – MRI Results

Base Case Scenario Outcomes with Sequential Market Clearing – MRI Demand Curve

Annual vs Two-Season

RTO price (weighted avg.):

- Annual \$109.69/ MW-day
- Sub-annual \$100.95/ MW-day

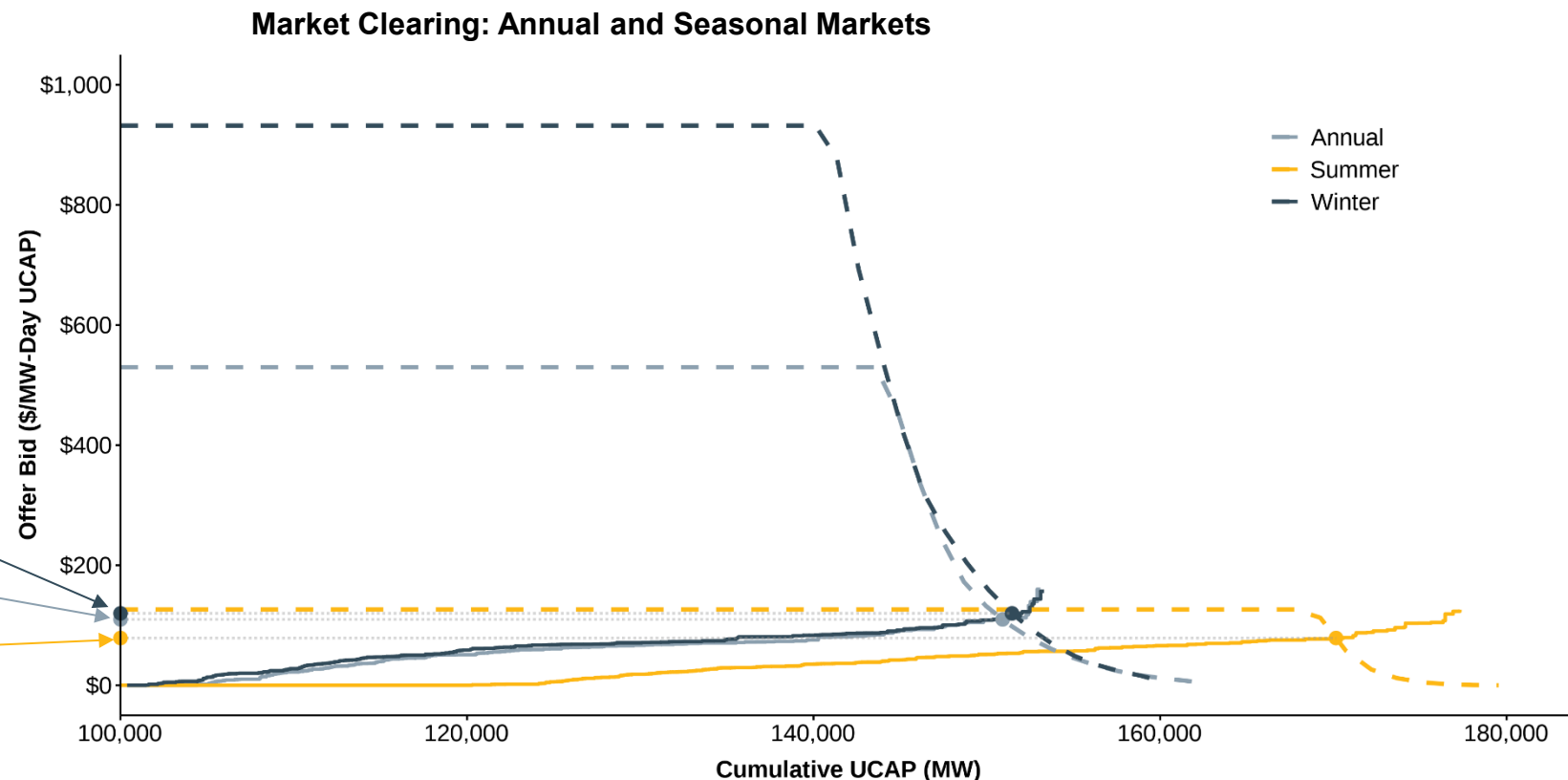
Historical:

- 2016/17-2024/25: \$85.97/ MW-day
- 2016/17-2026/27: \$124.80/ MW-day

Winter Clearing Price: \$119.76

Annual Clearing Price: \$109.69

Summer Clearing Price: \$82.34



Base Case Scenario Clearing Price – MRI Demand Curves

Annual vs. Seasonal Clearing Prices (\$/MW-Day)

LDA	Clearing Price (\$/MW-Day)
Annual	
RTO	\$109.69
Dominion	\$109.69
MAAC	\$109.69
EMAAC	\$109.69
SWMAAC	\$109.69
UCAP-weighted average price	\$109.69

Clearing prices in the annual construct are \$109.69/MW-Day

LDA	Clearing Price (\$/MW-Day)
Seasonal	
<i>Summer</i>	
RTO	\$ 70.47
Dominion	\$ 70.47
MAAC	\$103.60
EMAAC	\$103.60
SWMAAC	\$103.60
UCAP-weighted average price	\$ 82.34

Summer prices vary, reflecting price adders in import-constrained LDAs

<i>Winter</i>	
RTO	\$119.76
Dominion	\$119.76
MAAC	\$119.76
EMAAC	\$119.76
SWMAAC	\$119.76
UCAP-weighted average price	\$119.76

Winter prices are uniform, reflecting that none of the LDAs are import-constrained

<i>Seasonal Total</i>	
UCAP-weighted average price	\$100.95

Base Case Scenario Total Payments – MRI Demand Curves

Annual vs. Seasonal Capacity Payments (\$M)

	<u>Annual</u> <u>(\$M)</u>	<u>Seasonal</u>			<u>Seasonal - Annual</u>	
		<u>Summer</u> <u>(\$M)</u>	<u>Winter</u> <u>(\$M)</u>	<u>Seasonal Total</u> <u>(\$M)</u>	<u>Absolute</u> <u>(\$M)</u>	<u>Percent</u> <u>(%)</u>
RTO	\$ 6,058	\$2,581	\$ 3,301	\$ 5,882	-\$ 176	- 2.9%
Dominion	\$ 869	\$ 317	\$ 475	\$ 791	-\$ 78	- 8.9%
MAAC	\$ 2,075	\$1,164	\$ 1,115	\$ 2,279	\$ 204	9.8%
EMAAC	\$ 937	\$ 543	\$ 497	\$ 1,041	\$ 104	11.1%
SWMAAC	\$ 270	\$ 149	\$ 149	\$ 297	\$ 27	10.0%

- Small reduction in customer payments (less than 3%)
- Payments increase in MAAC, but decrease in Dominion and RTO

Base Case Scenario Production Costs – MRI Demand Curves

Reduction in Production Costs

Annual vs. Seasonal Production Costs (\$M)

	<u>Annual</u> <u>(\$M)</u>	<u>Seasonal</u>			<u>Seasonal - Annual</u>	
		<u>Summer</u> <u>(\$M)</u>	<u>Winter</u> <u>(\$M)</u>	<u>Seasonal Total</u> <u>(\$M)</u>	<u>Absolute</u> <u>(\$M)</u>	<u>Percent</u> <u>(%)</u>
RTO	\$1,122	\$410	\$631	\$1,040	-\$82	- 7.3%
Dominion	\$ 74	\$ 17	\$ 44	\$ 60	-\$13	-18.1%
MAAC	\$ 521	\$230	\$279	\$ 509	-\$12	- 2.3%
EMAAC	\$ 180	\$ 79	\$102	\$ 181	\$ 1	0.3%
SWMAAC	\$ 98	\$ 48	\$ 50	\$ 98	\$ 0	0.0%

- Production costs decrease as some resources that clear in winter do not clear in summer, and to a lesser extent, resources that clear in summer do not clear in winter
- Reduction in production costs may not represent efficiency gain because sequential clearing is not necessarily optimal
- Some resources that do not clear in summer might prefer to supply because their incremental costs (contingent on supplying in winter) is less than their offers

Current Market Scenario Outcomes with Sequential Market Clearing – MRI Demand Curves

Annual vs Two-Season

RTO price (weighted avg.):

- Annual \$217.06 MW-day
- Sub-annual \$188.89 MW-day

Historical:

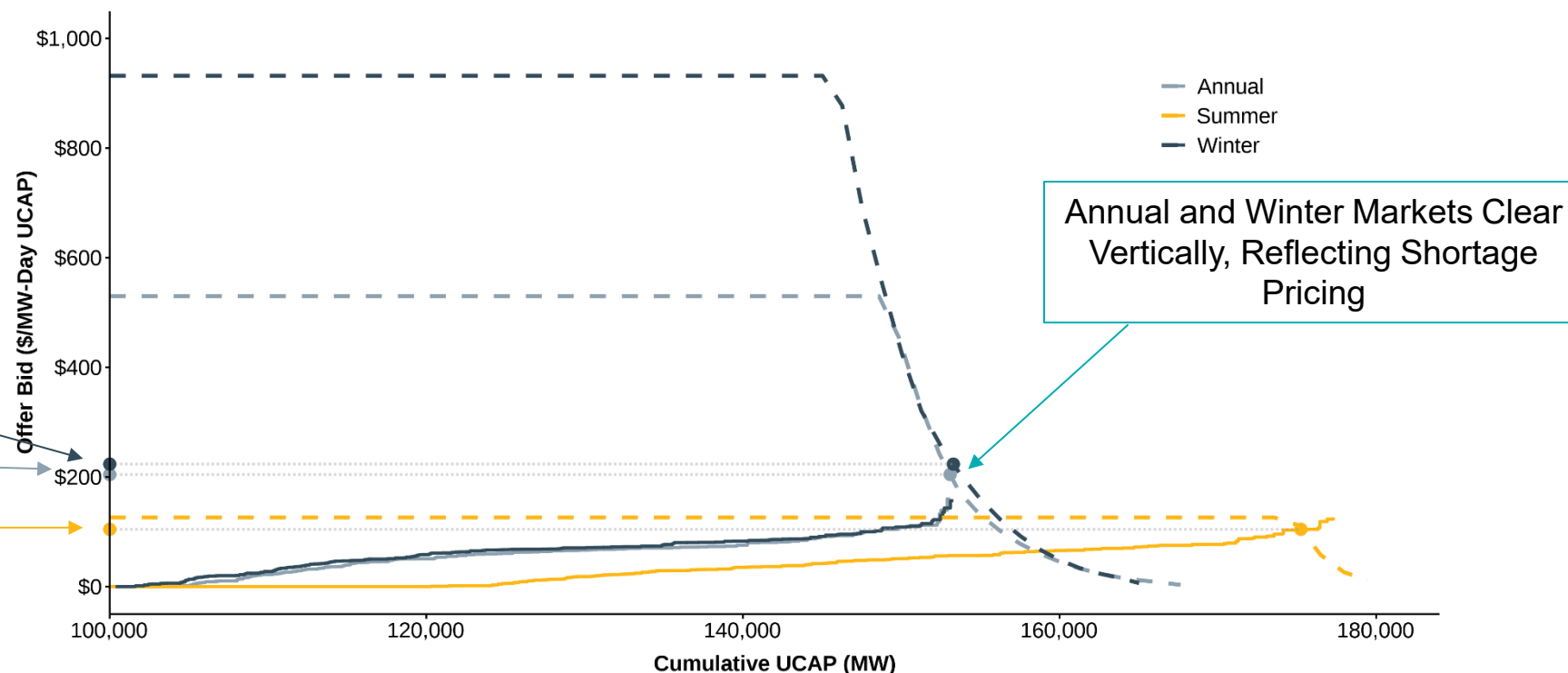
- 2016/17-2024/25: \$85.97 MW-day
- 2016/17-2026/27: \$124.80 MW-day
- 2025/26-2026/27: \$299.55 MW-day

Winter Clearing Price: \$223.65

Annual Clearing Price: \$217.06

Summer Clearing Price: \$154.52

Market Clearing: Annual and Seasonal Markets



Current Market Scenario Clearing Price – MRI Demand Curves

Annual vs. Seasonal Clearing Prices (\$/MW-Day)

LDA	Clearing Price (\$/MW-Day)
Annual	
RTO	\$204.62
Dominion	\$277.92
MAAC	\$204.62
EMAAC	\$204.62
SWMAAC	\$250.33
UCAP-weighted average price	\$217.06

Clearing prices in the annual construct are \$217.06, weighted by UCAP

LDA	Clearing Price (\$/MW-Day)
Seasonal	
<i>Summer</i>	
RTO	\$ 88.47
Dominion	\$119.04
MAAC	\$261.10
EMAAC	\$261.10
SWMAAC	\$261.10
UCAP-weighted average price	\$154.52

Summer prices vary, reflecting price adders in import-constrained LDAs

<i>Winter</i>	
RTO	\$223.65
Dominion	\$223.65
MAAC	\$223.65
EMAAC	\$223.65
SWMAAC	\$223.65
UCAP-weighted average price	\$223.65

Winter prices are uniform, reflecting that none of the LDAs are import-constrained

<i>Seasonal Total</i>	
UCAP-weighted average price	\$188.89

Current Market Scenario Total Payments – MRI Demand Curves

Annual vs. Seasonal Capacity Payments (\$M)

	<u>Annual</u> <u>(\$M)</u>	<u>Seasonal</u>			<u>Seasonal - Annual</u>	
		<u>Summer</u> <u>(\$M)</u>	<u>Winter</u> <u>(\$M)</u>	<u>Seasonal Total</u> <u>(\$M)</u>	<u>Absolute</u> <u>(\$M)</u>	<u>Percent</u> <u>(%)</u>
RTO	\$12,162	\$4,995	\$ 6,240	\$11,234	-\$ 928	- 7.6%
Dominion	\$ 2,215	\$ 552	\$ 892	\$ 1,443	-\$ 772	-34.8%
MAAC	\$ 4,087	\$3,015	\$ 2,152	\$ 5,167	\$1,080	26.4%
EMAAC	\$ 1,841	\$1,409	\$ 998	\$ 2,407	\$ 566	30.8%
SWMAAC	\$ 617	\$ 375	\$ 278	\$ 653	\$ 36	5.8%

- Small reduction in customer payments (less than 8%)
- Payments increase in MAAC, but decrease in Dominion

Current Market Scenario Production Costs – MRI Demand Curves

Annual vs. Seasonal Production Costs (\$M)

	<u>Annual</u> <u>(\$M)</u>	<u>Seasonal</u>			<u>Seasonal - Annual</u>	
		<u>Summer</u> <u>(\$M)</u>	<u>Winter</u> <u>(\$M)</u>	<u>Seasonal Total</u> <u>(\$M)</u>	<u>Absolute</u> <u>(\$M)</u>	<u>Percent</u> <u>(%)</u>
RTO	\$1,224	\$516	\$675	\$1,191	-\$33	- 2.7%
Dominion	\$ 81	\$ 30	\$ 47	\$ 77	-\$ 3	- 4.2%
MAAC	\$ 587	\$267	\$320	\$ 587	\$ 0	0.0%
EMAAC	\$ 240	\$ 97	\$143	\$ 240	\$ 0	0.0%
SWMAAC	\$ 98	\$ 48	\$ 50	\$ 98	\$ 0	0.0%

- Production costs decrease as some resources that clear in winter do not clear in summer
- Reduction in production costs may not represent efficiency gain because sequential clearing is not necessarily optimal
- Some resources that do not clear in summer might prefer to supply because their incremental costs (contingent on supplying in winter) is less than their offers