



CPV Retail.

Navigating the Impacts of PJM's Base Residual Auction Prices

A CPV Retail Webinar

Webinar Speakers



Sarah DeVon – Vice President, Sales

Moderator



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CPV Retail™

CPV Retail, an affiliate of Competitive Power Ventures (CPV), is your trusted retail energy provider and advisor.

Our team of experts help to demystify the complexities of the energy landscape and provide tailored solutions that empower your business to thrive in a cleaner, greener future.

Our Promise to You



Proven Industry Experience



Actionable Market Insights



Boutique-Style Customer Service

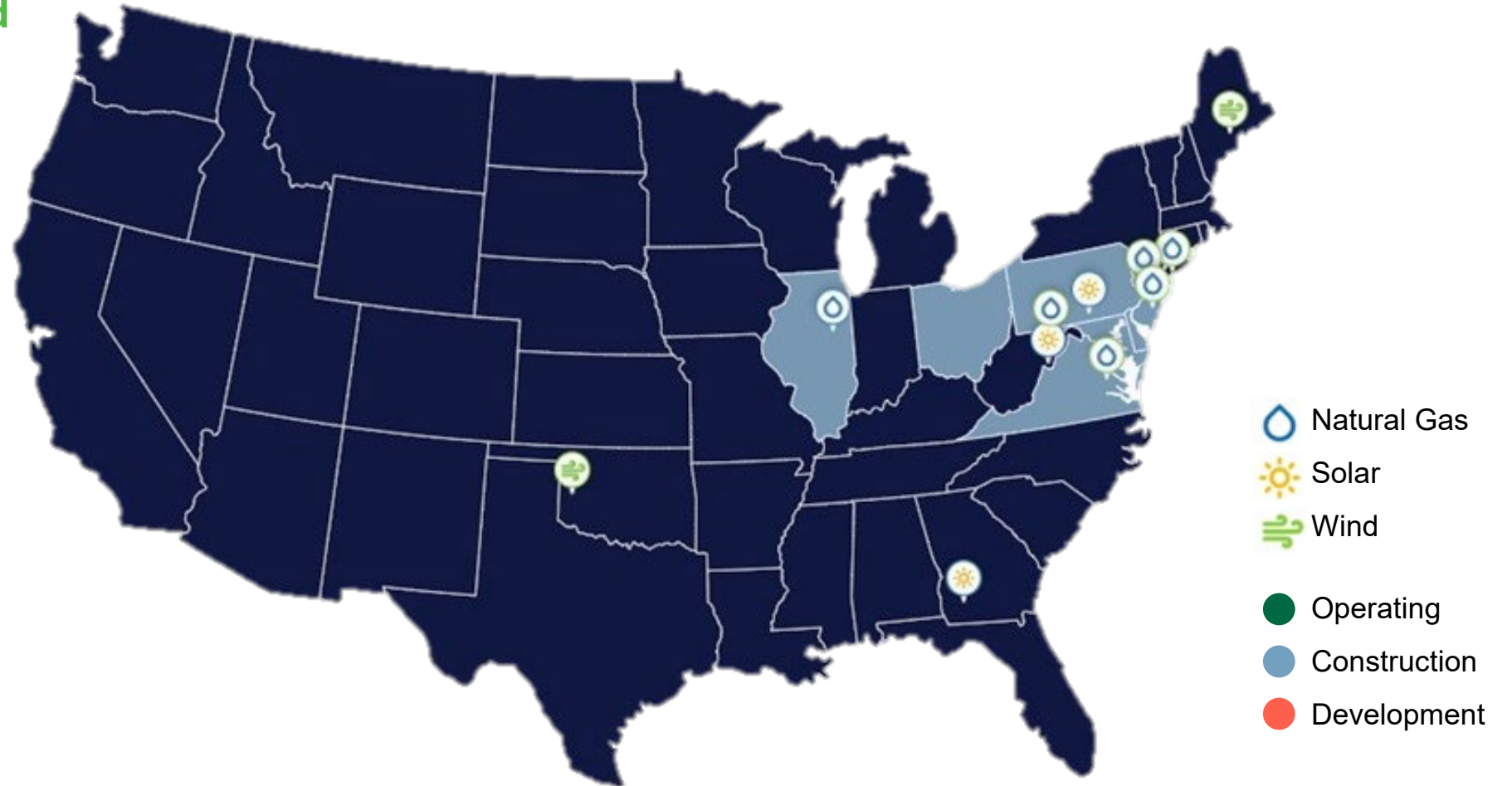
A Partner You Can Rely On



Providing locally sourced energy solutions within PJM territory

CPV Retail is currently licensed as a retail electricity supplier in

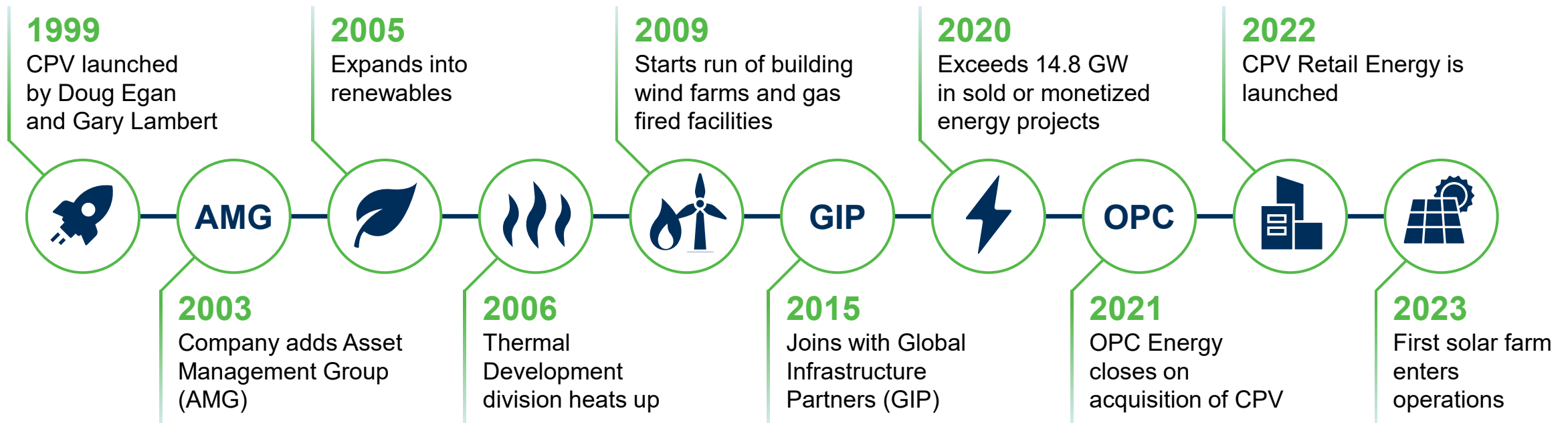
- Delaware
- District of Columbia
- Illinois
- Ohio
- Maryland
- New Jersey
- Pennsylvania
- Virginia



CPV: 25 Years of Energetic Growth



- ✓ Competitive Power Ventures (CPV) is a leading North American developer, owner, and operator of both highly efficient, low-emitting electric and renewable generation projects.
- ✓ With over two decades of unparalleled success, CPV has a history of applying its development, financial, and project management expertise to advance the next generation of technologies while contributing to grid reliability through our existing fleet.
- ✓ CPV is committed to delivering low-carbon power that helps drive the nation's decarbonization goals forward while sharing the benefits of our assets directly with customers through our CPV Retail division.



16.5+ GW

of power generation facilities developed, sold, financed and acquired since 1999

\$7.8 billion

developed and financed in the last 12 years



SAFETY DRIVEN

CPV's owned assets are

40% better

than industry average on Recordable Incident Rates

DEVELOPMENT



11

power facilities developed and financed since 2010



6.4 GW

of natural gas, wind, and solar generation brought online since 2010



10+ GW

in development pipeline

OPERATIONS



44

major power facilities managed



6.1 GW

currently under management



22 GW

managed since inception

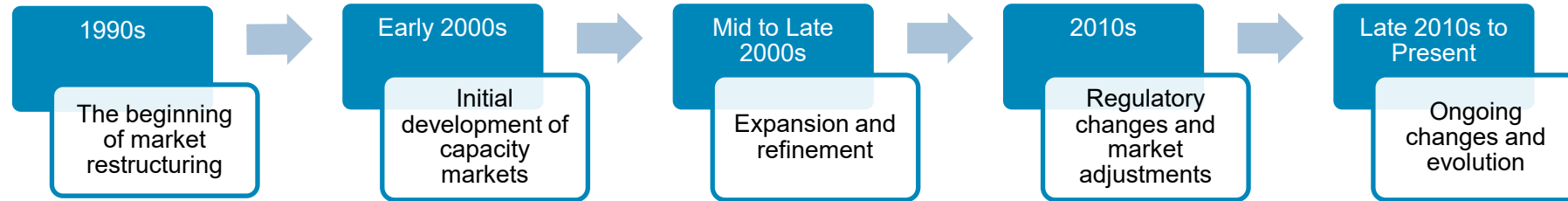
PJM Capacity Auction Results



Delivery Year	Auction Results				
	Resource Clearing Price	Cleared UCAP (MW)	RPM Reserve Margin	Total Reserve Margin ¹	Total Cost to Load (\$ billion)
2015/16 ²	\$136.00	164,561.2	19.7%	19.3%	\$9.7
2016/17 ³	\$59.37	169,159.7	20.7%	20.3%	\$5.5
2017/18	\$120.00	167,003.7	20.1%	19.7%	\$7.5
2018/19	\$164.77	166,836.9	20.2%	19.8%	\$10.9
2019/20	\$100.00	167,305.9	22.9%	22.4%	\$7.0
2020/21 ⁴	\$76.53	165,109.2	23.9%	23.3%	\$7.0
2021/22	\$140.00	163,627.3	22.0%	21.5%	\$9.3
2022/23	\$50.00	144,477.3	21.1%	19.9%	\$3.9
2023/24	\$34.13	144,870.6	21.6%	20.3%	\$2.2
2024/25	\$28.92	147,478.9	21.7%	20.4%	\$2.2
2025/26 ³	\$269.92	135,684.0	18.6%	18.5%	\$14.7

Source: PJM (Aug. 2024), “2025/2026 Base Residual Auction Report,” available [online here](#). See source for footnotes.

History of Installed Capacity Markets in the U.S.



- 1990s: Electricity restructuring underway
- 1996: FERC Order 888 requires open access to transmission
- 2000-2001: California energy crisis
- 2001: New York ISO implements capacity market
- 2003: Northeast blackout. New York implements downward-sloping demand curve
- 2006: ISO-New England launches forward capacity market
- **2007-2008 PJM implements Reliability Pricing Model (RPM), conducts first Base Residual Auction (BRA) for 2007-2008**
- 2011: FERC Order 1000 reforms transmission planning and cost allocation
- **2015: PJM implements capacity performance design**
 - In response to Polar Vortex
- 2020-2021: Focus on renewables, resilience, and state policy
- 2022-present: Ongoing debates and regulatory proceedings on distributed-energy resources, demand flexibility, impact of state decarbonization goals, among others.
- **2024: PJM implements Effective Load Carrying Capability (ELCC) methodology** for 2025/2026 delivery year; applied fleetwide, impacting all supply resources

How is Capacity Different from Energy?



	Energy	Capacity
Units	\$ per MWh	\$ per MW-day
Pricing	<ul style="list-style-type: none"> • Price based on the next cheapest available energy • Prices vary by location due to transmission limits and losses • Daily and sub-hourly markets, energy purchased for next day 	<ul style="list-style-type: none"> • Price based on the next cheapest capacity resource or administratively-set demand curve • Prices reflect the value of added reliability • Some areas price higher if demand exceeds local supply and transmission capability • Prices set monthly and yearly
Supply	<ul style="list-style-type: none"> • Based on how much it costs to generate electricity • Rules ensure prices reflect competition 	<ul style="list-style-type: none"> • Based on the cost to provide capacity • Separate pricing for existing and new capacity • Rules intended to mitigate exercise of market power
Demand	<ul style="list-style-type: none"> • Day-ahead market solved based on day-ahead, hourly load forecasts; real-time market solved with nearer-term forecast; final outcomes settled with actuals vs. DA and RT 	<ul style="list-style-type: none"> • Ensures enough capacity to meet peak yearly demand • Includes extra margin (typically 15-18%) for uncertainties like outages, weather changes, and renewable generation profiles • Reliability criteria are being revisited as new problems are encountered: Duck curve, intermittent resource variability, and winter fuel security.
Transmission	<ul style="list-style-type: none"> • Transmission limits affect prices; areas with limits pay more 	<ul style="list-style-type: none"> • Models areas with transmission limits, ensuring enough capacity is available in constrained areas
Regulatory	<ul style="list-style-type: none"> • Relatively simple, standardized design; minimal significant changes over time since standard market designs of 2000s 	<ul style="list-style-type: none"> • More complex, often updated due to high cost/revenue potential and political interests

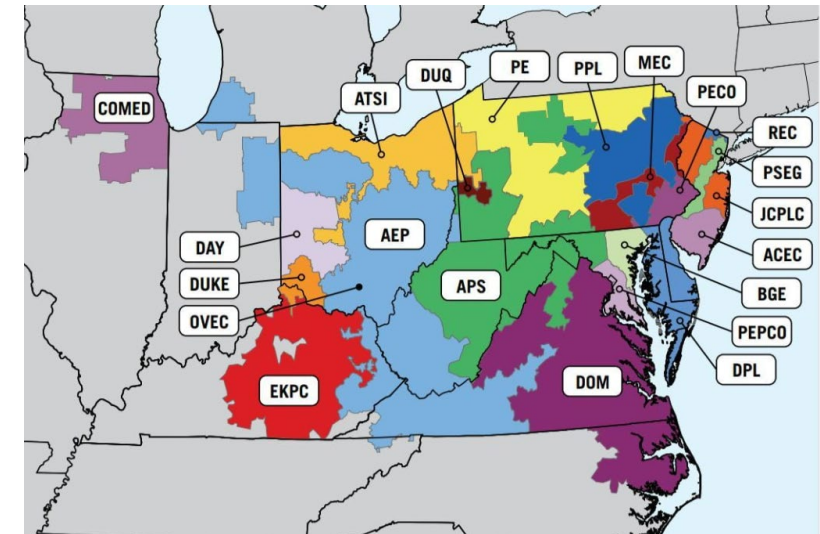
Capacity market features:

- “3-year forward” auction for June-May delivery; 3 incremental annual auctions leading up to the delivery year; recent auctions significantly delayed by regulatory proceedings
- Demand curve has two sloped segments (vs. one in New York ISO and convex in ISO-New England)
- Transmission-constrained zones are modeled separately which enables them to clear at higher prices

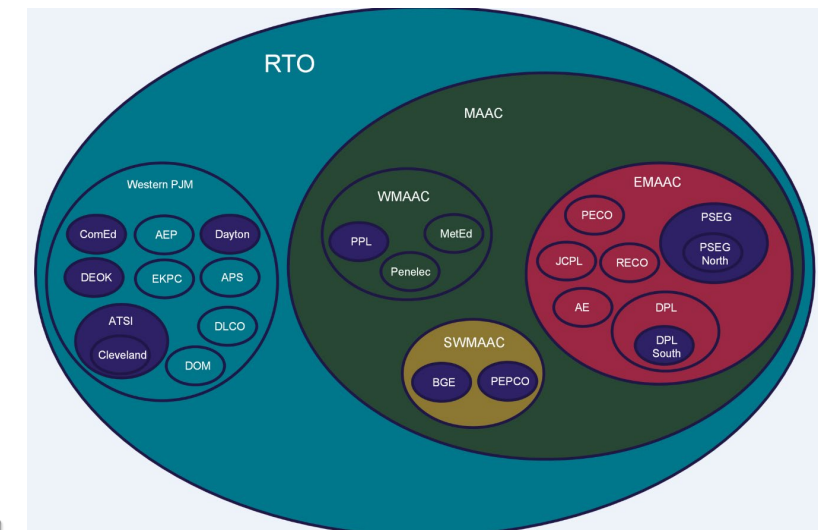
Recent changes and developments

- Offer floors for subsidized resources: 2019, Minimum Offer Pricing Rule (MOPR) expanded to all resources; 2021, expanded MOPR reversed.
- Capacity Performance rules: 2015 implementation; December 2022, varied performance during Storm Elliot prompted re-design.
- Seller offer caps: Supplier offers capped at the class average net avoidable cost rate, unless granted a unit-specific exception. Cost does not include capacity performance (CP) risk. Current rules affirmed in FERC Order EL19-47 (2024). Remains contentious and unfavorable.
- ELCC/Accreditation: 2023, Effective Load Carrying Capability (ELCC) class ratings determined for intermittent resources and storage; 2024, ELCC class ratings extended to conventional resources.
- Resource adequacy issues and low prices (signaling the market is long). Effects of subsidies, supplier microeconomics, rebounding load growth after 17 years.

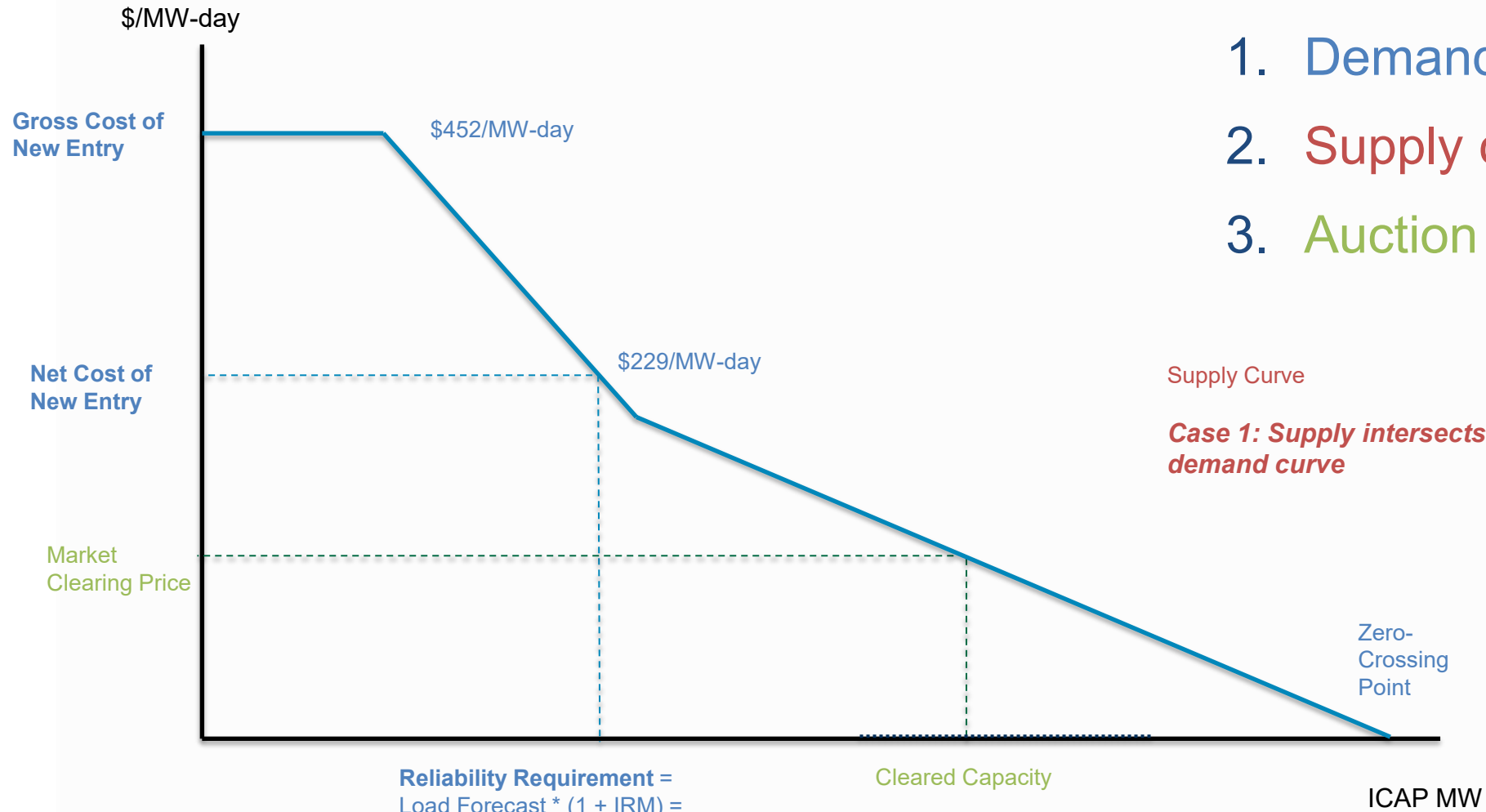
PJM Service Territory



PJM Capacity Zones



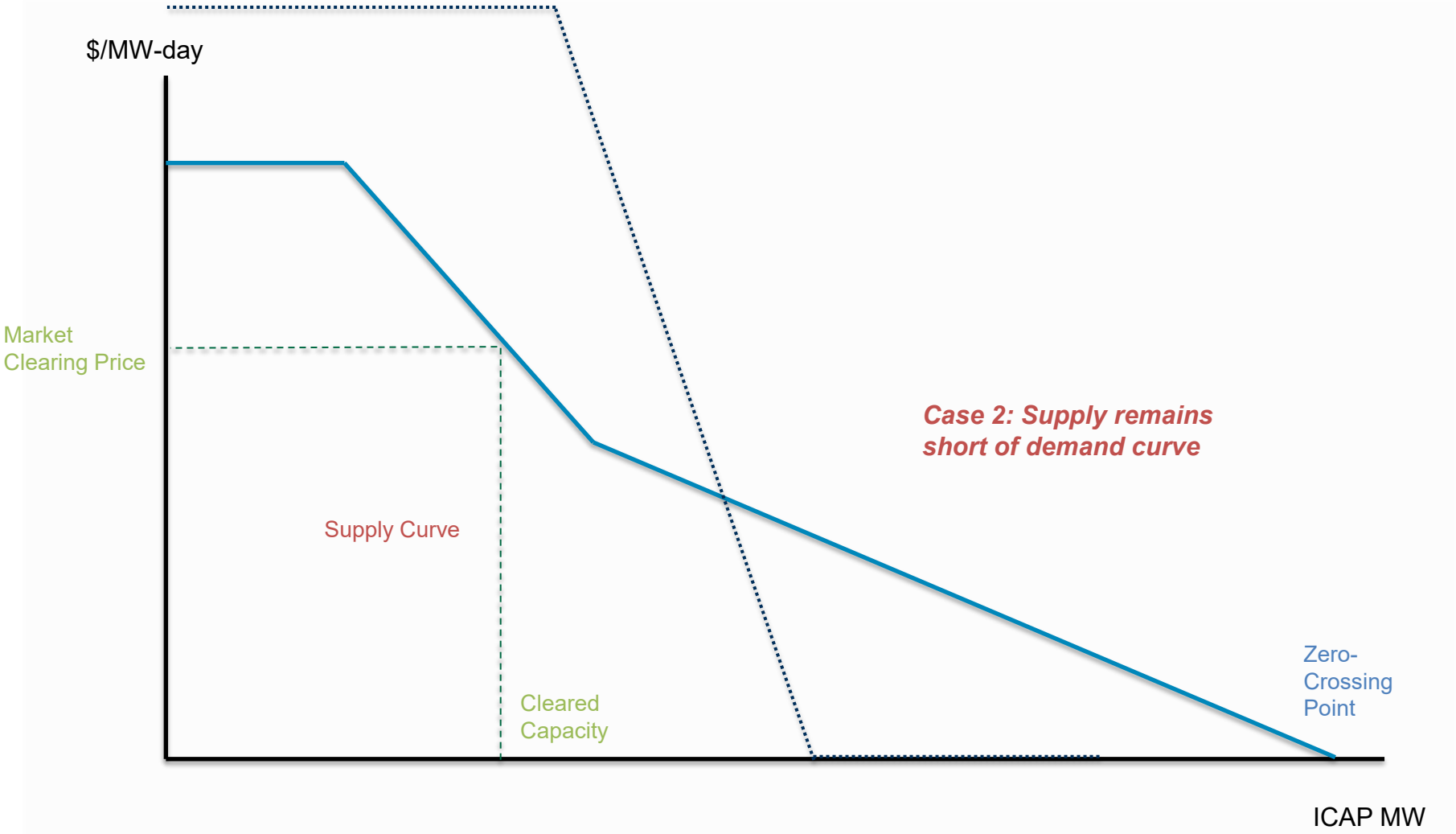
Key Concepts in PJM Capacity Market (Case 1)



1. Demand curve
2. Supply curve
3. Auction solution

Supply Curve
Case 1: Supply intersects demand curve

Key Concepts, Continued (Case 2)



- **Installed Capacity Requirement:** Equal to peak load * (1 + reserve margin target), where the reserve margin (RM) target is the level of capacity required to limit bulk-system outages to 1 day in 10 years, the NERC criterion. Converted to accredited unforced capacity by multiplying by the system-wide effective load carrying capability (ELCC). Determined by PJM's Planning Department via loss of load simulations.
- **Net Cost of New Entry (Net CONE):** Net cost of new entry of a theoretical, prospective entrant. Calculated as the levelized capital cost, plus fixed costs, net of energy & ancillary services margins, initially expressed as an annual value but converted to daily or monthly.
- **Reference Point:** The resulting (x,y) coordinate from #1 & #2.
- **Zero Crossing Point:** The x-intercept determines the slope of the curve and is intended to reflect the marginal reliability value of adding capacity beyond the requirement. PJM's Variable Resource Requirement (VRR) curves have two downward-sloping segments.
- **Supply Curve:** Suppliers' offers sorted ascending by price. Quantities are accredited MW of unforced capacity (UCAP). Competitive offer prices either reflect net going-forward costs (for existing resources) or the net cost of new entry (for new resources). Offers are often constrained to floors/caps to mitigate exercise of market power.
- **Market Clearing Price**
- **Cleared UCAP**

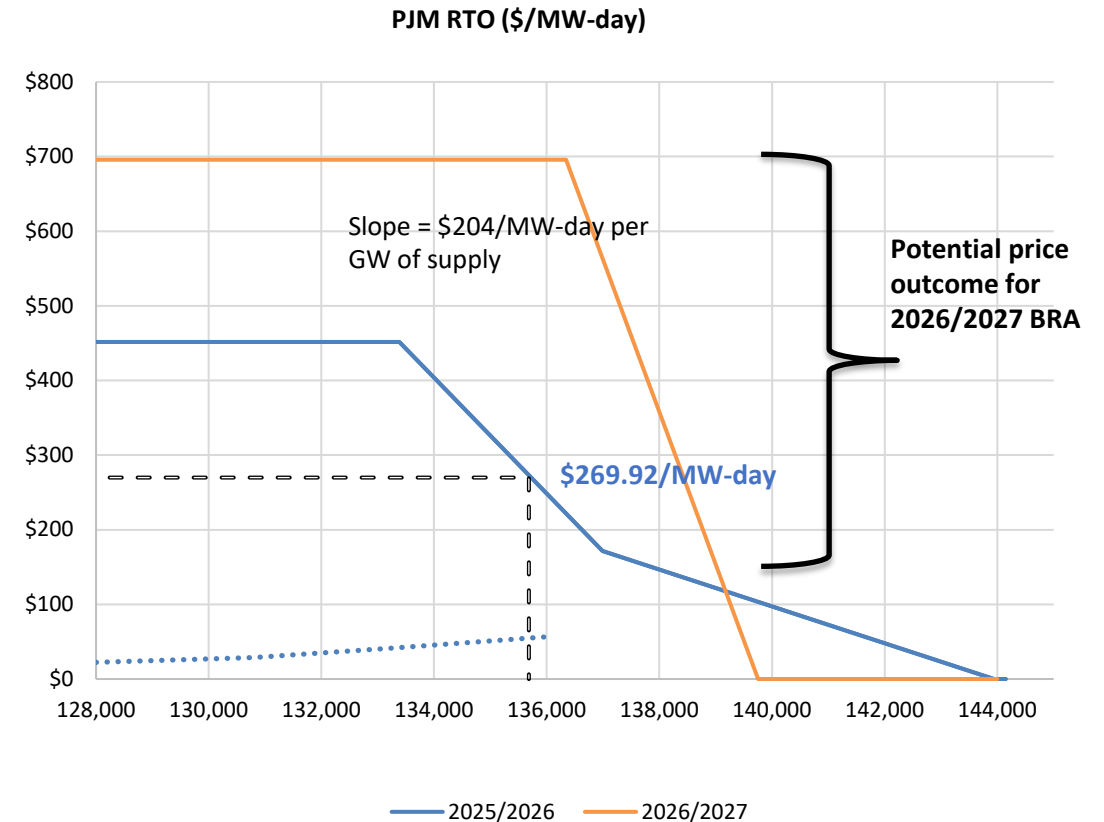
- ◆ Demand Impact (~8 GW)
 - ✓ *Forecasted Peak Load increased by 3.2 GW*
 - ✓ *Reserve margin requirement increased by 4.8 GW*
 - ✓ *Dominion load and supply returned to BRA (had previously elected FRR)*
- ◆ Supply Impact (~6 GW)
 - ✓ *Proposed retirements increased by 5.7 GW (the largest increase in 10 years)*
 - Includes Brandon Shores and Wagner, both of which are operating under reliability must-run contracts (RMRs)
- ◆ Effective Load-Carrying Capability (ELCC) Introduced

➤ Overall ~14 GW tightening of supply/demand balance

2026/2027 Auction Outlook



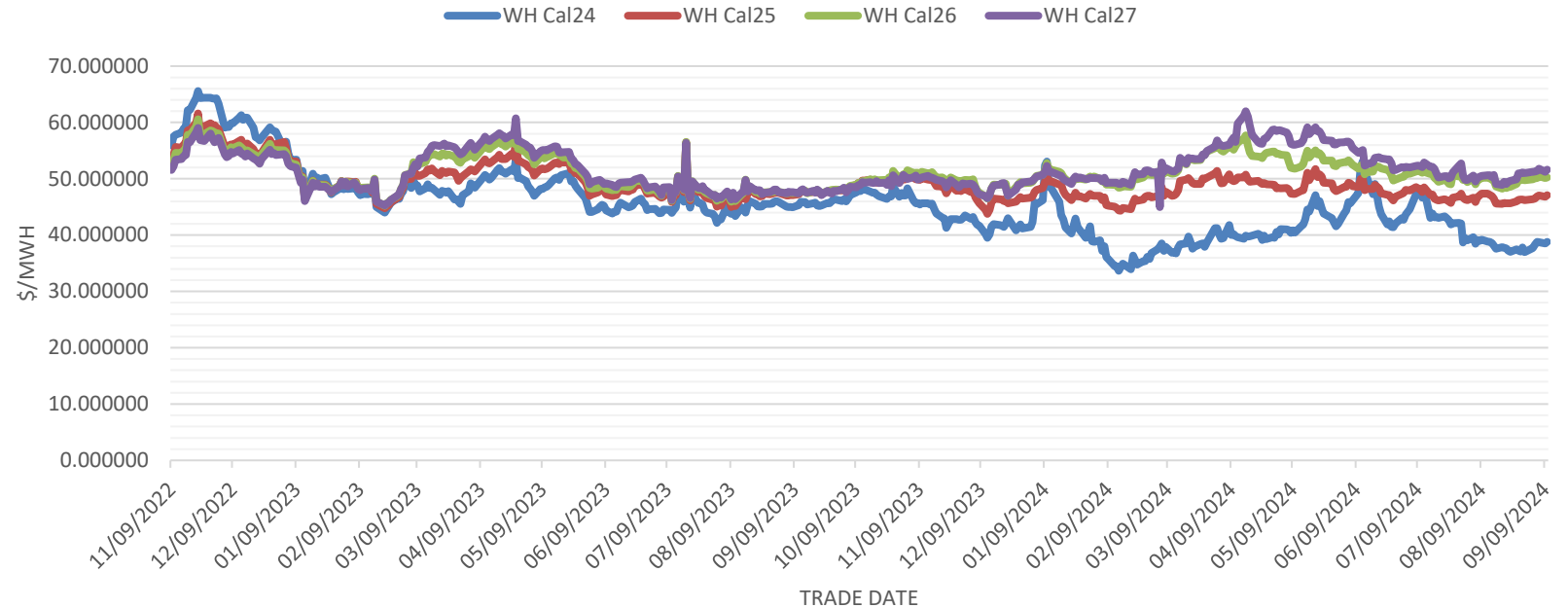
- ◆ Currently scheduled for December 2024
- ◆ Increases in peak load (2.9 GW) and reserved margin (0.8% or 1.3 GW)
- ◆ Cost of New Entry (CONE) increased 53% to \$695/MW-day to reflect modeling of combined cycle vs. combustion turbine, previously
- ◆ Supply:
 - ✓ Trumbull CCGT addition (846 MW)
 - ✓ Potential for incremental demand response, uprates
 - ✓ Potential return of planned retirements. 2025/2026 auction had 2.5 GW of filed deactivations and 3.5 GW of planned deactivations that hadn't filed.
- ◆ Results expected to be volatile with potential for additional price increases



- ◆ One-off event or trend?
- ◆ Disconnect between data center load growth and when new supply can feasibly enter the market.
 - ✓ *PJM interconnection queue backlog; new projects will not be studied until 2026.*
 - ✓ *Regulatory and environmental concerns create additional impediments for thermal supply growth.*
- ◆ EPA CO2 regulations and political uncertainty
- ◆ A repeat high clearing price could lead to additional regulatory scrutiny and intervention.
 - ✓ *Market design changes, future auction delays, state-subsidized entry, and risk of re-regulation.*
- ◆ Treatment of RMR units in capacity markets
- ◆ Facilitating financing of new thermal assets

- ◆ The forward markets support the sentiment of load growth in the outer years with curves from 2025 forward being elevated anywhere from 5%-44% when compared to 2024
- ◆ Despite the elevated curves there have been several buying opportunities presented in the forwards

PJM West Hub ATC Cal Strips



Avg Curve Price by Month					
Month	WH Cal24	WH Cal25	WH Cal26	WH Cal27	
1/1/2024	\$ 44.10	\$ 47.85	\$ 50.46	\$ 50.33	
2/1/2024	\$ 35.95	\$ 45.89	\$ 49.64	\$ 50.06	
3/1/2024	\$ 37.94	\$ 48.51	\$ 52.38	\$ 52.35	
4/1/2024	\$ 39.96	\$ 49.77	\$ 55.24	\$ 57.68	
5/1/2024	\$ 42.55	\$ 48.87	\$ 53.41	\$ 57.46	
6/1/2024	\$ 45.94	\$ 48.19	\$ 51.77	\$ 54.09	
7/1/2024	\$ 43.82	\$ 47.13	\$ 50.41	\$ 51.60	
8/1/2024	\$ 38.18	\$ 46.31	\$ 49.41	\$ 50.11	
9/1/2024	\$ 38.48	\$ 46.77	\$ 50.15	\$ 51.43	

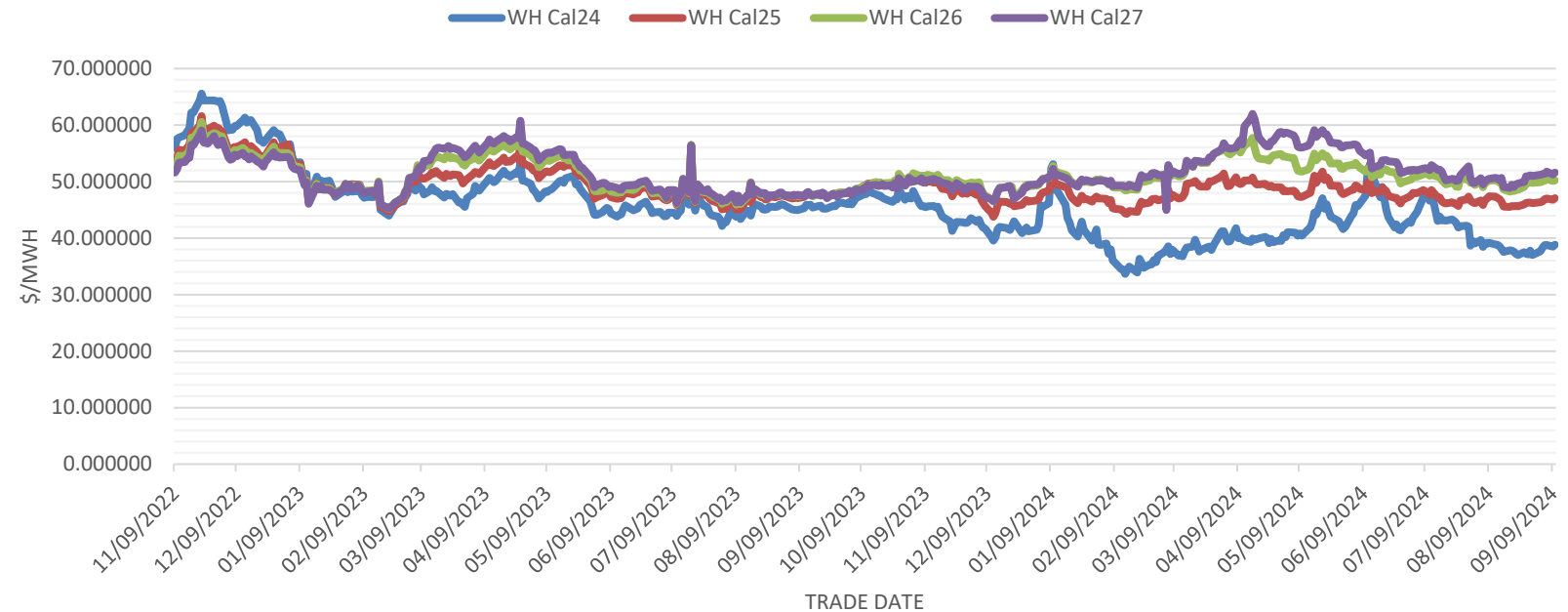
Comparisons to Cal24			
Month	Cal24-Cal25	Cal24-Cal26	Cal24-Cal27
1/1/2024	8%	14%	14%
2/1/2024	28%	38%	39%
3/1/2024	28%	38%	38%
4/1/2024	25%	38%	44%
5/1/2024	15%	26%	35%
6/1/2024	5%	13%	18%
7/1/2024	8%	15%	18%
8/1/2024	21%	29%	31%
9/1/2024	22%	30%	34%

The Forward Market (cont.)



- ◆ With easing of gas production all eyes have been on weather events and how the storage will be impacted with higher demand
- ◆ The cold snap in Jan24 and the heat dome in Jun24 drove the forwards up temporarily but was mainly impacting the balance of 24

PJM West Hub ATC Cal Strips



Max Increase in Fwds					Max Decrease in Fwds				
Month	WH Cal24	WH Cal25	WH Cal26	WH Cal27	Month	WH Cal24	WH Cal25	WH Cal26	WH Cal27
1/1/2024	20%	5%	5%	4%	1/1/2024	-10%	-3%	-2%	-2%
2/1/2024	9%	3%	2%	3%	2/1/2024	-6%	-3%	-2%	-2%
3/1/2024	5%	3%	5%	5%	3/1/2024	-3%	-4%	-3%	-14%
4/1/2024	5%	3%	4%	7%	4/1/2024	-2%	-2%	-3%	-3%
5/1/2024	11%	6%	3%	3%	5/1/2024	-6%	-3%	-3%	-2%
6/1/2024	16%	4%	3%	5%	6/1/2024	-10%	-4%	-4%	-5%
7/1/2024	10%	3%	2%	3%	7/1/2024	-12%	-3%	-3%	-3%
8/1/2024	4%	2%	2%	2%	8/1/2024	-3%	-2%	-2%	-2%
9/1/2024	1%	1%	1%	1%	9/1/2024	-2%	-1%	0%	0%

What can we do to help in high price environments and uncertainty?



- ◆ With CPV's generation fleet of over 10GWs, CPV Retail is uniquely positioned to offer fixed capacity products to provide budget certainty and provide a sense of comfort for the unknown planning years
- ◆ CPV Retail can offer flexible product structures that allow you to lock in a portion of your consumption in the future years whenever the buying opportunities arise for both energy and capacity
- ◆ CPV Retail plans to offer a product that gives you the option to receive 5CP alerts which helps reduce the "Q"- Quantity in the equation when calculating your cost for Capacity
- ◆ Behind the meter solutions can also help you reduce your consumption during the grid's peak hours
- ◆ Reducing your demand during the grid's peak hours will also help you reduce your carbon footprint and CPV Retail can help you understand how much you have reduced with our Carbon Footprint Report



CPV Retail.

Thank you for your participation.

- ✓ Visit CPVRetail.com for more information
- ✓ Contact us at retailinfo@cpv.com

- **ACR:** Avoidable Cost Rate - Calculated as a generator's annual fixed O&M plus an annualized portion of capital expenditures.
- **BRA:** Base Residual Auction - An auction run by PJM to procure capacity resources for a specific delivery year, three years in advance.
- **CETL:** Capacity Emergency Transfer Limit - In PJM, the amount of capacity that can be imported into a constrained capacity LDA.
- **CONE:** Cost of New Entry
- **DA:** Day-Ahead Market - A forward market where energy is bought and sold a day before it is needed, allowing participants to commit to buying or selling electricity a day in advance of its delivery.
- **ELCC:** Effective Load Carrying Capability - A measure of a power resource's ability to meet additional demand and maintain reliability. It is particularly relevant when considering resources that are variable or non-dispatchable, such as wind or solar power.
- **FCM:** Forward Capacity Market – The markets operated by ISO New England and PJM Interconnection to procure electricity capacity three years before it is needed, ensuring that the region will have enough power to meet future demand.
- **FERC:** Federal Energy Regulatory Commission – The federal agency that regulates the interstate transmission of electricity, natural gas, and oil.
- **ISO:** Independent System Operator - An organization formed at the direction of the Federal Energy Regulatory Commission (FERC) to coordinate, control, and monitor the operation of the electrical power system, as well as to facilitate competition among wholesale electricity markets.
- **kW-month:** kilowatt-month - A measure of energy usage representing the use of power at a rate of one kilowatt over the span of one month.
- **kW-year:** kilowatt-year - A unit of energy representing the consistent use of power at a rate of one kilowatt over the course of one year.
- **LDA:** Locational Deliverability Area - Commonly referred to as a "capacity zone"; these are zones defined by PJM based on transmission limitations to serve load.
- **MOPR:** Minimum Offer Price Rules - PJM's offer floor rule that previously restricted new entrants from bidding below certain levels, based on net CONE.
- **MWh:** megawatt-hour - A unit of energy equivalent to one megawatt (1 MW) of power expended for one hour of time.
- **MW-day:** megawatt-day - A unit of energy equivalent to one megawatt of power expended over the course of one day.
- **Net CONE:** net cost of new entry.
- **Net E&AS offset:** projected net energy and ancillary services revenues, used as an offset in net CONE and net ACR calculations.
- **PJM:** PJM Interconnection - A regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia.
- **RT:** Real-Time Market - A market where electricity prices are determined in real-time, based on actual demand and supply conditions, typically settled on an hourly basis.
- **RPM:** Reliability Pricing Model - A capacity market design used by PJM to ensure long-term grid reliability by securing the appropriate amount of power supply resources needed to meet predicted energy demand in the future.