

# Capacity Auction Clearing with Resource Specific FRR

Markets & Reliability Committee  
Special Session: PJM Response  
to FERC on Capacity Market  
Reforms Meeting  
August 15, 2018

Joe Bowring  
Devendra Canchi  
John Hyatt

Alexandra Salaneck

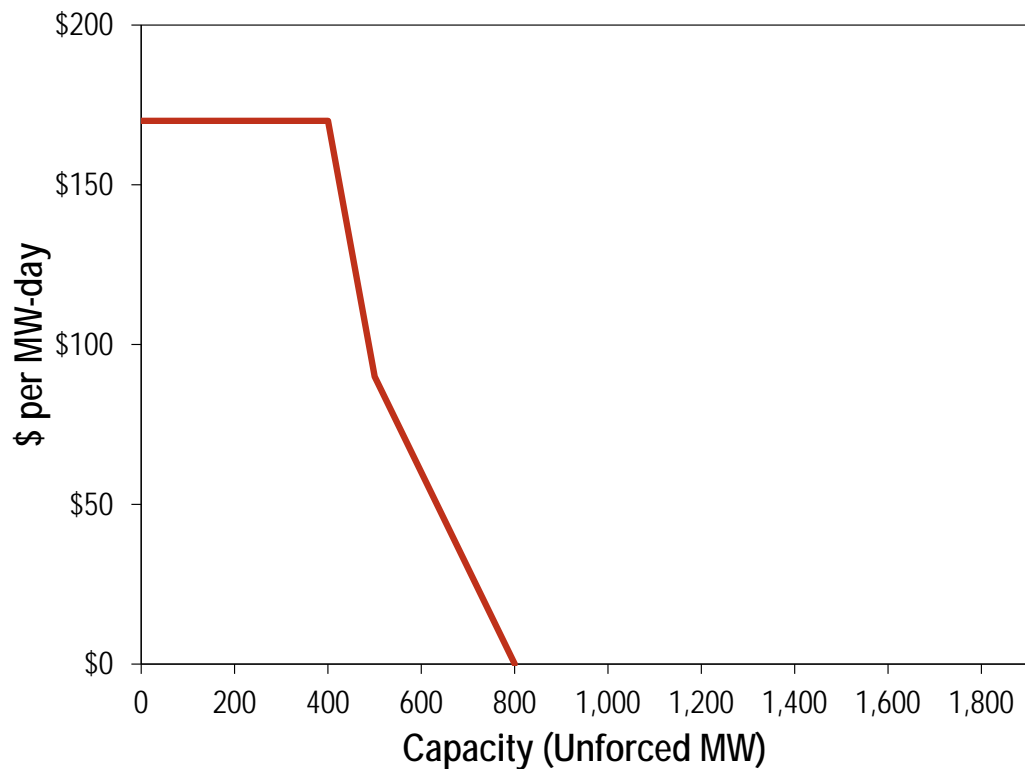


Monitoring Analytics

# Overview

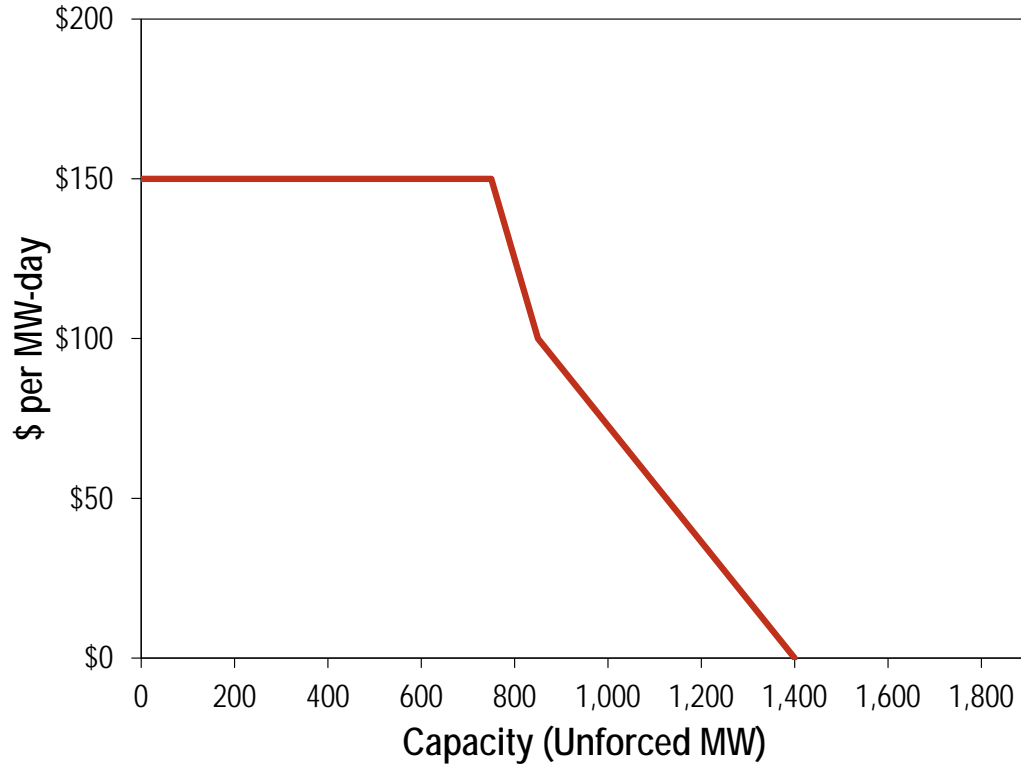
- **Resource specific FRR results in price suppression if the subsidized resource would not clear in the auction without FRR**
- **Resource specific FRR does not have any impact on prices if the subsidized resource fully clears in the auction without FRR**
- **Simple example with two LDAs**
- **With unit specific FRR, load will pay more in the longer term due to the resulting inefficient fleet of resources**
- **With unit specific FRR, clearing prices will not provide efficient entry and exit signals**

# Examples: Child LDA



	Capacity (Unforced MW)	Offer (\$/MW-day)
Res C1	125.0	\$15.00
Res C2	140.0	\$25.00
Res C3	110.0	\$45.00
Res C4	100.0	\$65.00
Res C5	70.0	\$72.00
Res C6	125.0	\$85.00
Res C7	200.0	\$110.00
Res C8	75.0	\$140.00

# Examples: Parent LDA

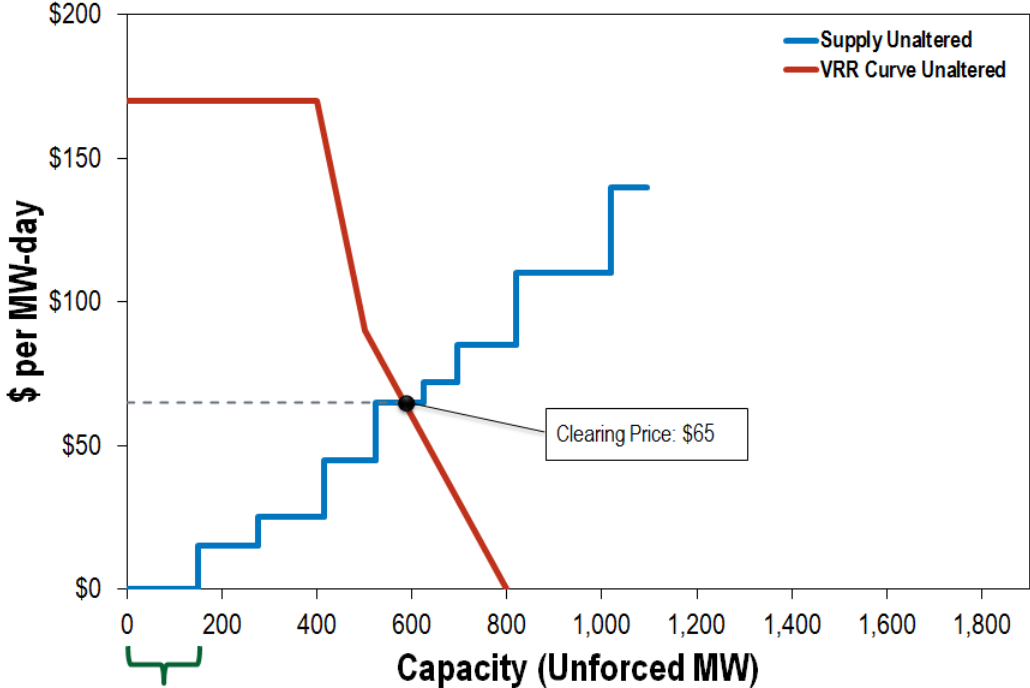


	Capacity (Unforced MW)	Offer (\$/MW-day)
Res P1	150.0	\$5.00
Res P2	200.0	\$15.00
Res P3	160.0	\$30.00
Res P4	95.0	\$42.00
Res P5	240.0	\$55.00
Res P6	195.0	\$65.00
Res P7	110.0	\$75.00
Res P8	50.0	\$90.00

# Examples

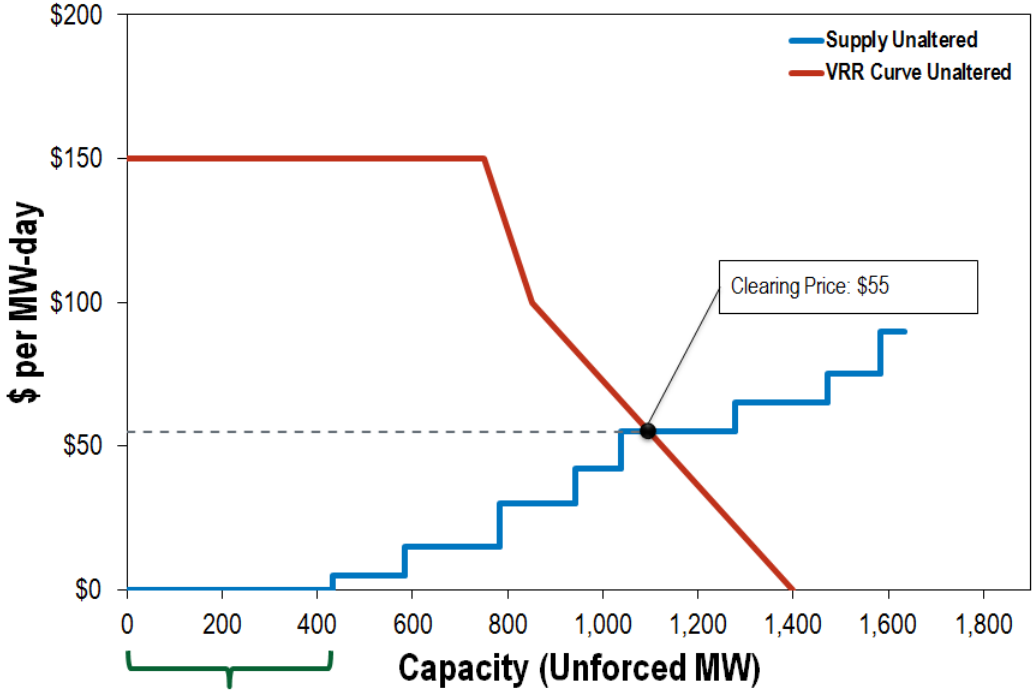
Scenario	Description	Implementation
Base Case	No resource specific FRR	
Example 1	FRR option for extramarginal resource	Removed Res C7; Shifted VRR curves left by 200 MW
Example 2	FRR option for inframarginal resource	Removed Res C2; Shifted VRR curves left by 140 MW
Example 3	FRR option for marginal resource	Removed Res C4; Shifted VRR curves left by 100 MW

# Base Case Child LDA



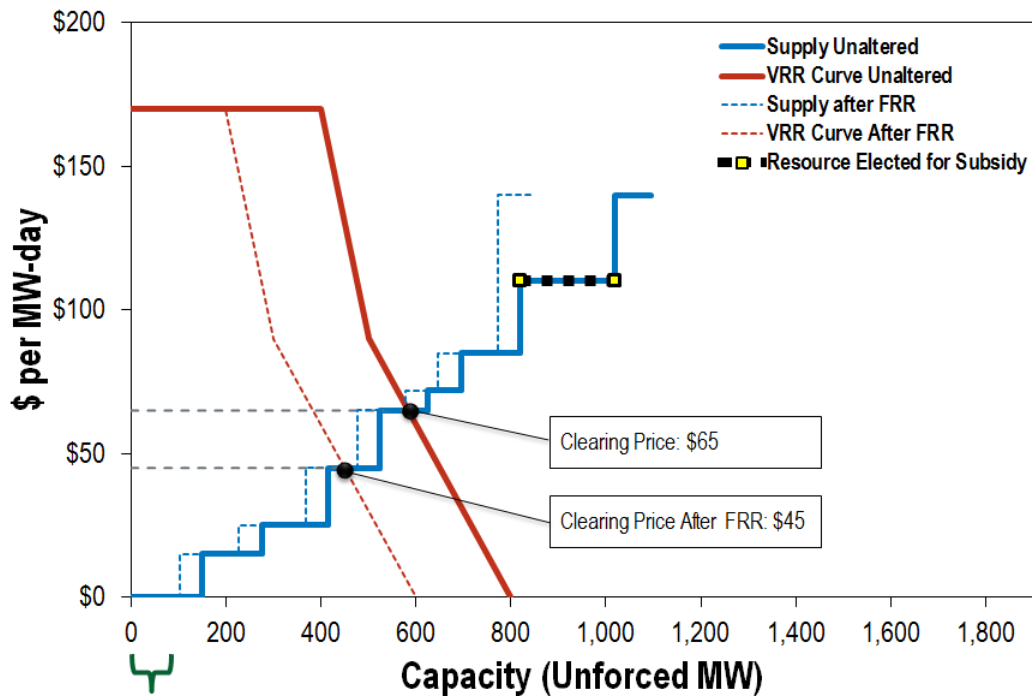
Imports from parent LDA  
(150 MW out of available 150 MW CETL)

# Base Case Parent LDA



(Child LDA's cleared VRR, net of imports: 433.3 MW )

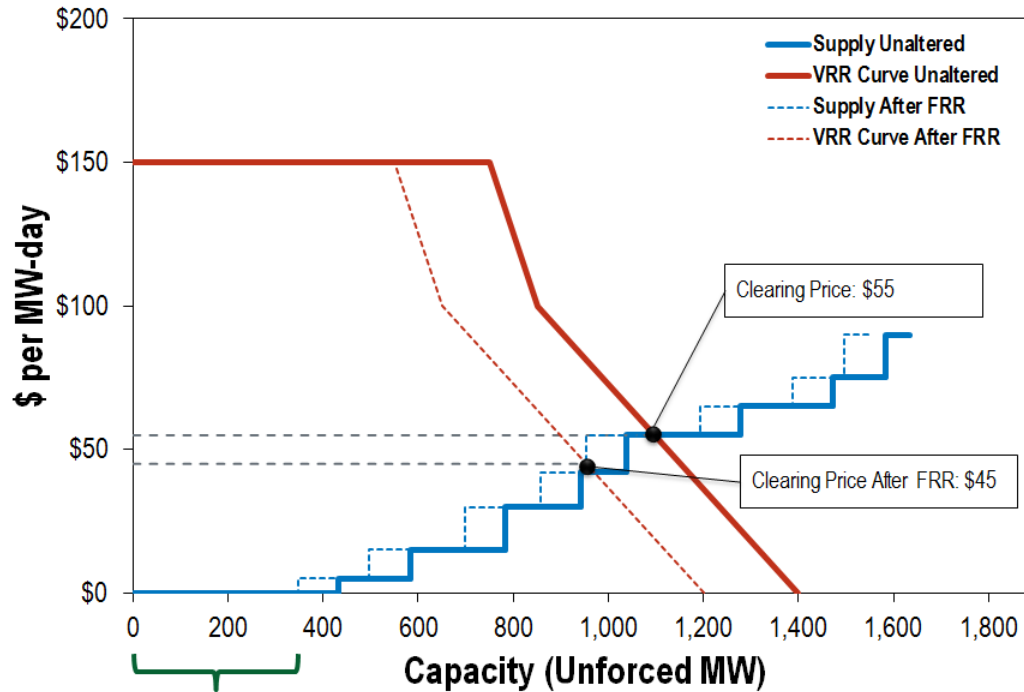
# Example 1: FRR for Extramarginal Resource Child LDA



Imports from parent LDA  
(102.5 MW out of available 150 MW CETL)

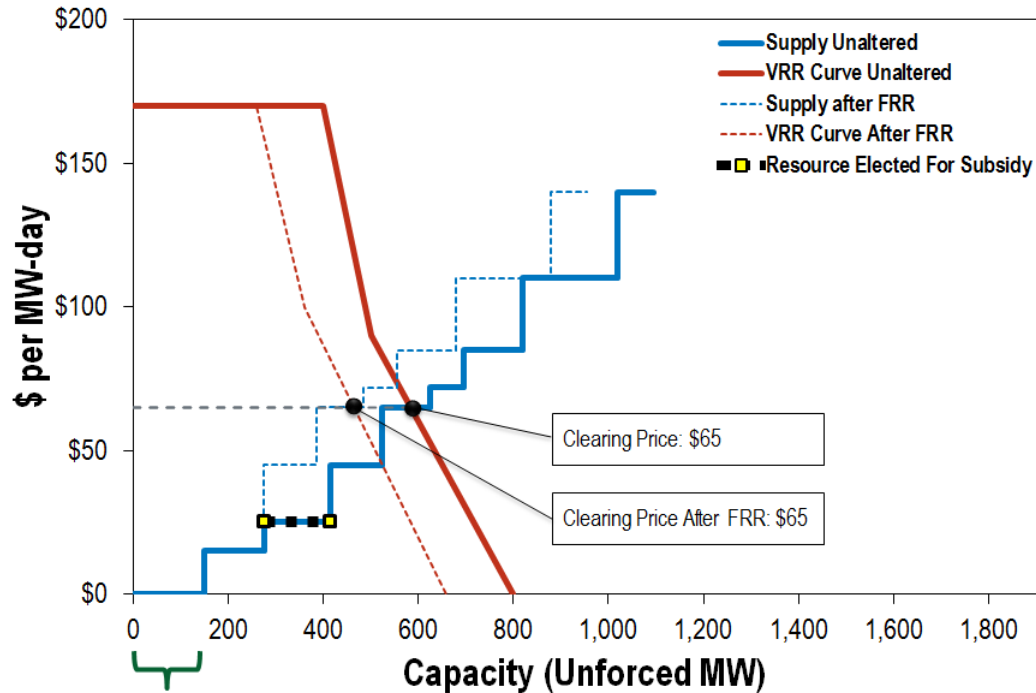


# Example 1: FRR for Extramarginal Resource Parent LDA



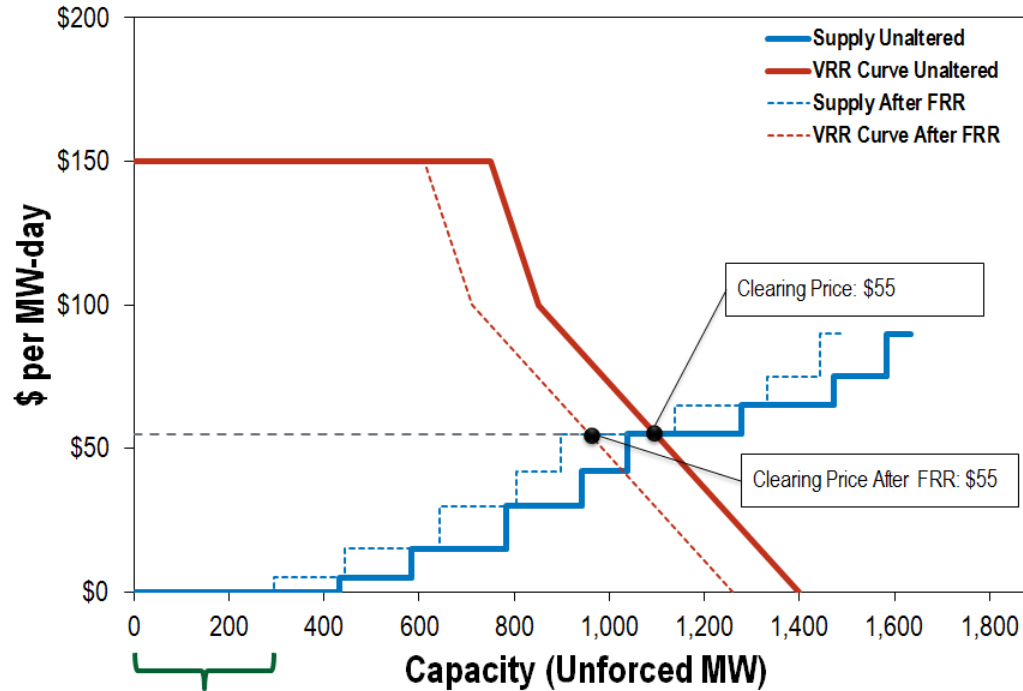
(Child LDA's cleared VRR, net of imports: 347.5 MW)

# Example 2: FRR for Inframarginal Resource Child LDA



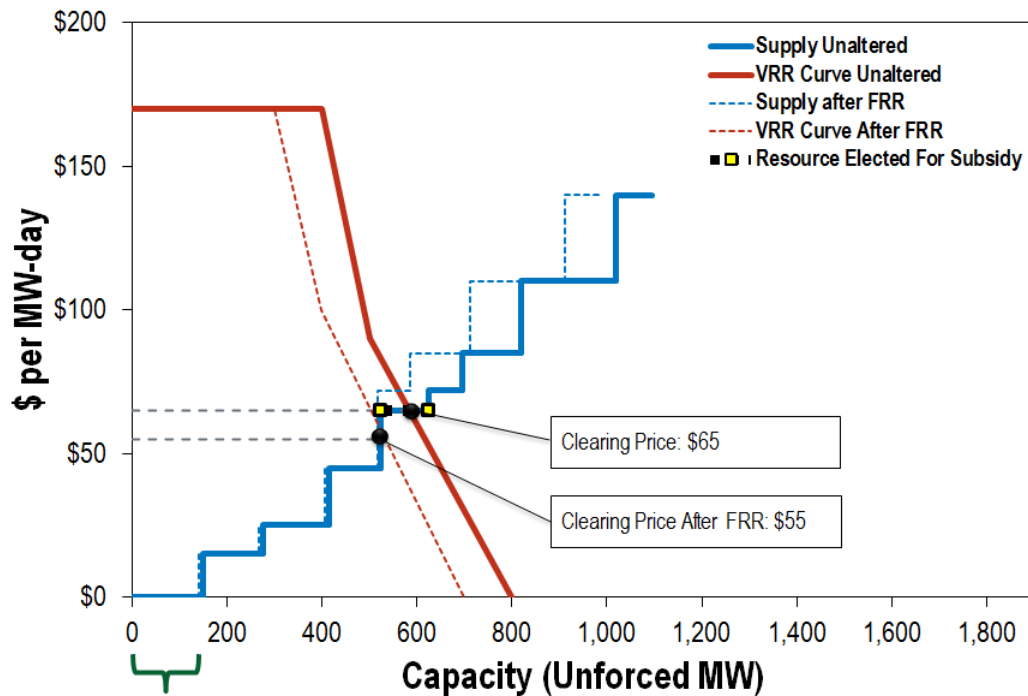
Imports from parent LDA  
(150 MW out of available 150 MW CETL)

# Example 2: FRR for Inframarginal Resource Parent LDA



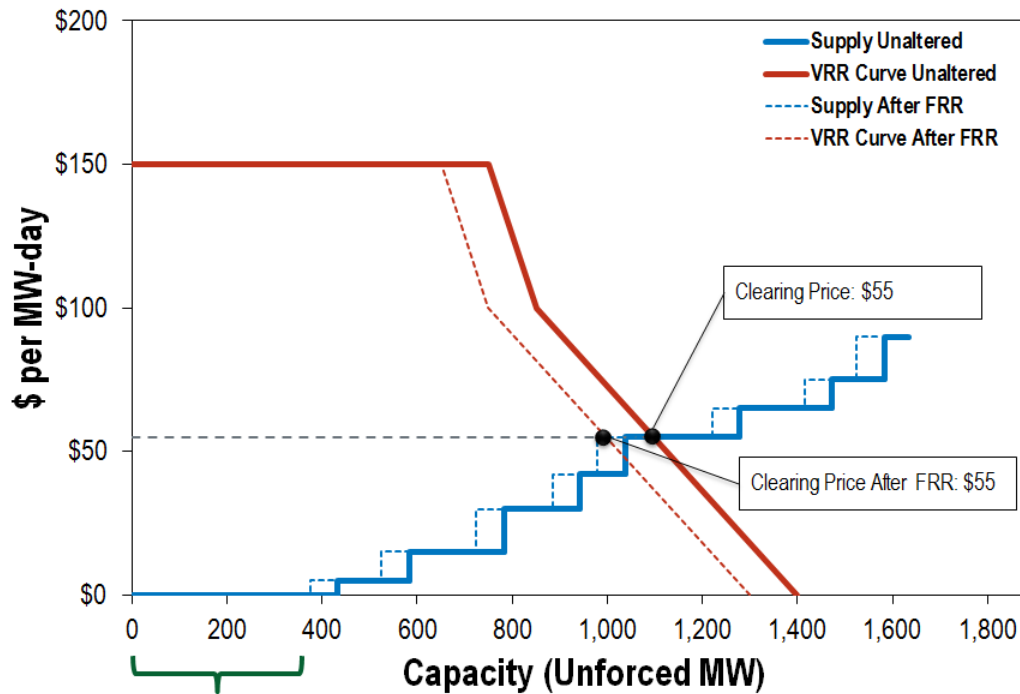
(Child LDA's cleared VRR, net of imports: 293.3 MW)

# Example 3: FRR for Marginal Resource Child LDA



Imports from parent LDA  
(141.7 MW out of available 150 MW CETL)

# Example 3: FRR for Marginal Resource Parent LDA



(Child LDA's cleared VRR, net of imports: 375 MW)

# Summary

Scenario	Description	Results			
		Clearing Price (\$/MW-day)		Change (\$/MW-day)	
		Child	Parent	Child	Parent
Base Case		\$65.00	\$55.00		
Example 1	FRR option for extramarginal resource	\$45.00	\$45.00	(\$20.00)	(\$10.00)
Example 2	FRR option for inframarginal resource	\$65.00	\$55.00	\$0.00	\$0.00
Example 3	FRR option for marginal resource	\$55.00	\$55.00	(\$10.00)	\$0.00

# Sensitivity Analyses

- **Offers and auction parameters from the 2021/2022 RPM Base Residual Auction were used to assess the impact of Resource Specific FRR under select scenarios.**
- **The auction was cleared with shifted demand and supply curves for each FRR scenario.**
- **Auction clearing was carried out under two assumptions:**
  - **Including LDA Minimum Internal Resource Requirements**
  - **Excluding LDA Minimum Internal Resource Requirements**

# FRR for all Cost of Service Units

LDA	Base Residual Auction	Minimum Internal Resource Requirements			No Minimum Internal Resource Requirements	
	Clearing Price (\$ per MW-Day)	Clearing Price (\$ per MW-Day)	Change (\$ per MW-day)	Clearing Price (\$ per MW-Day)	Change (\$ per MW-day)	
RTO	\$140.00	\$92.08	(\$47.92)	\$107.23	(\$32.77)	
ATSI	\$171.33	\$164.01	(\$7.32)	\$164.01	(\$7.32)	
ComEd	\$195.55	\$184.05	(\$11.50)	\$194.23	(\$1.32)	
EMAAC	\$165.73	\$176.00	\$10.27	\$165.00	(\$0.73)	
BGE	\$200.30	\$202.55	\$2.25	\$200.20	(\$0.10)	
PSEG	\$204.29	\$204.12	(\$0.17)	\$204.12	(\$0.17)	



# FRR for all Coal and Nuclear Units

LDA	Base Residual Auction	Minimum Internal Resource Requirements			No Minimum Internal Resource Requirements	
	Clearing Price (\$ per MW-Day)	Clearing Price (\$ per MW-Day)	Change (\$ per MW-day)	Clearing Price (\$ per MW-Day)	Change (\$ per MW-day)	
RTO	\$140.00	\$18.89	(\$121.11)	\$25.00	(\$115.00)	
ATSI	\$171.33	\$18.89	(\$152.44)	\$25.00	(\$146.33)	
ComEd	\$195.55	\$44.13	(\$151.42)	\$43.93	(\$151.62)	
EMAAC	\$165.73	\$206.58	\$40.85	\$150.91	(\$14.82)	
BGE	\$200.30	\$305.18	\$104.88	\$150.91	(\$49.39)	
PSEG	\$204.29	\$206.58	\$2.29	\$202.19	(\$2.10)	

# FRR for Units at Risk of Retirement

LDA	Base Residual Auction	Minimum Internal Resource Requirements		No Minimum Internal Resource Requirements	
	Clearing Price (\$ per MW-Day)	Clearing Price (\$ per MW-Day)	Change (\$ per MW-day)	Clearing Price (\$ per MW-Day)	Change (\$ per MW-day)
RTO	\$140.00	\$82.01	(\$57.99)	\$90.16	(\$49.84)
ATSI	\$171.33	\$82.01	(\$89.32)	\$90.16	(\$81.17)
ComEd	\$195.55	\$135.00	(\$60.55)	\$90.16	(\$105.39)
EMAAC	\$165.73	\$111.14	(\$54.59)	\$122.23	(\$43.50)
BGE	\$200.30	\$352.06	\$151.76	\$90.16	(\$110.14)
PSEG	\$204.29	\$111.14	(\$93.15)	\$122.23	(\$82.06)

# FRR for Solar and Wind Units

LDA	Minimum Internal Resource Requirements			No Minimum Internal Resource Requirements	
	Base Residual Auction Clearing Price (\$ per MW-Day)	Clearing Price (\$ per MW-Day)	Change (\$ per MW-day)	Clearing Price (\$ per MW-Day)	Change (\$ per MW-day)
RTO	\$140.00	\$135.20	(\$4.80)	\$137.96	(\$2.04)
ATSI	\$171.33	\$171.33	\$0.00	\$171.33	\$0.00
ComEd	\$195.55	\$184.05	(\$11.50)	\$190.99	(\$4.56)
EMAAC	\$165.73	\$165.73	\$0.00	\$165.73	\$0.00
BGE	\$200.30	\$200.30	\$0.00	\$200.30	\$0.00
PSEG	\$204.29	\$202.82	(\$1.47)	\$202.82	(\$1.47)

**Monitoring Analytics, LLC**

**2621 Van Buren Avenue**

**Suite 160**

**Eagleville, PA**

**19403**

**(610) 271-8050**

**[MA@monitoringanalytics.com](mailto:MA@monitoringanalytics.com)**

**[www.MonitoringAnalytics.com](http://www.MonitoringAnalytics.com)**

