Residual Metered Load Pricing Overview

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Comparing RT Load Pricing to Mixed Nuts

- To improve understanding of the concept of real-time pricing in PJM, it might help to use an analogy
- Consider pricing real-time load to be similar to pricing mixed nuts
  - Assume each nut sold separately would sell for:

	Price/Pound		Price/Pound
Cashews	$ 10.00	Hazelnuts	$ 7.00
Pistachios	$ 9.00	Pecans	$ 6.00
Walnuts	$ 8.00	Peanuts	$ 5.00

  - Assume the nuts are combined in a large container in equal parts and sold for $7.50 per pound.

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Mixed Nuts Analogy

- Assume a customer picks all of the cashews and pistachios out of the container
  - The price per pound of mixed nuts isn't adjusted
  - Still charging $7.50 per pound despite the more expensive nuts being removed (Similar to current Zonal Price)
  - Could argue the price per pound should decrease to $6.50 (similar to Residual Metered Load aggregate price)

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Residual Metered Load Pricing Overview

- Currently all load settled in PJM is can be priced two ways:
  - At a designated node or aggregate (must follow M-27, section 5.6, 5.7)
  - At the Zone in which the load is located
- The Zonal price is calculated as the hourly average price at all of the buses in the Zone, including those buses that are priced nodally.
- In 2012, stakeholders approved the creation of Residual Metered Load aggregates to represent the hourly average price of all buses in the Zone*, less any buses that have nodal pricing.
- Approved by FERC in 2013, implementation date is 6/1/2015

*In the event a zone has more than one fully metered EDC, RML aggregates are created for each of the fully metered EDCs

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Drivers for Implementation

- Residual Metered Load aggregate price more accurately reflects the composition of non-nodal priced load in the zone
  - More precise load pricing
- Physical and residual zone prices may become more disparate with the introduction of more nodal load
- Creates parity for all non-nodal load in the zone

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Residual Metered Load Pricing Overview

- Residual Zone (Residual Metered Load aggregates)
  - An aggregate containing all load buses in the fully metered EDC territory, minus all load that has been designated to be priced at a specific non-zonal (or nodal) location

- Residual Metered Load Pricing approved for implementation on 6/1/2015
  - Use of the Residual Metered Load aggregate LMP rather than the physical zone LMP for pricing Real-Time load
    - All non-nodal load in the zone will be priced at the same pricing point
    - Nodal load will continue to be priced at the applicable nodal pricing point
    - No opt out provisions

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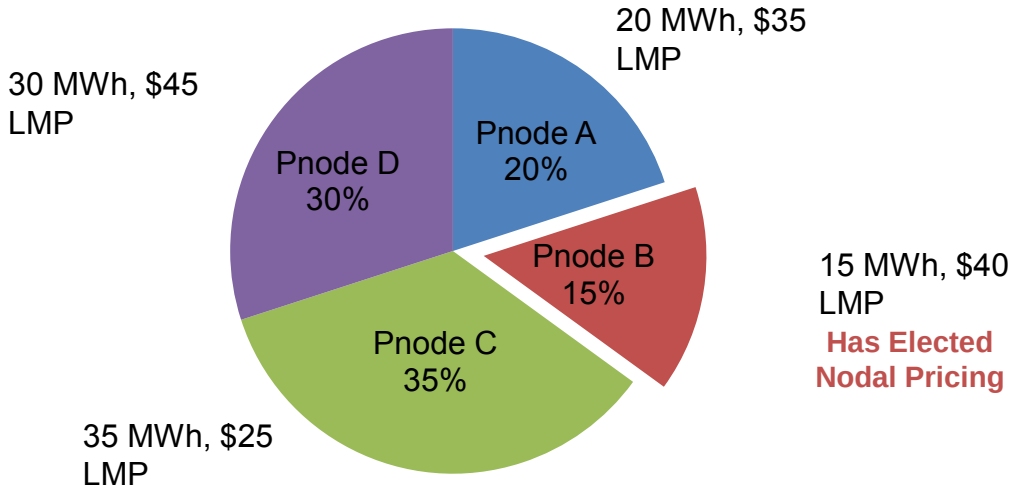
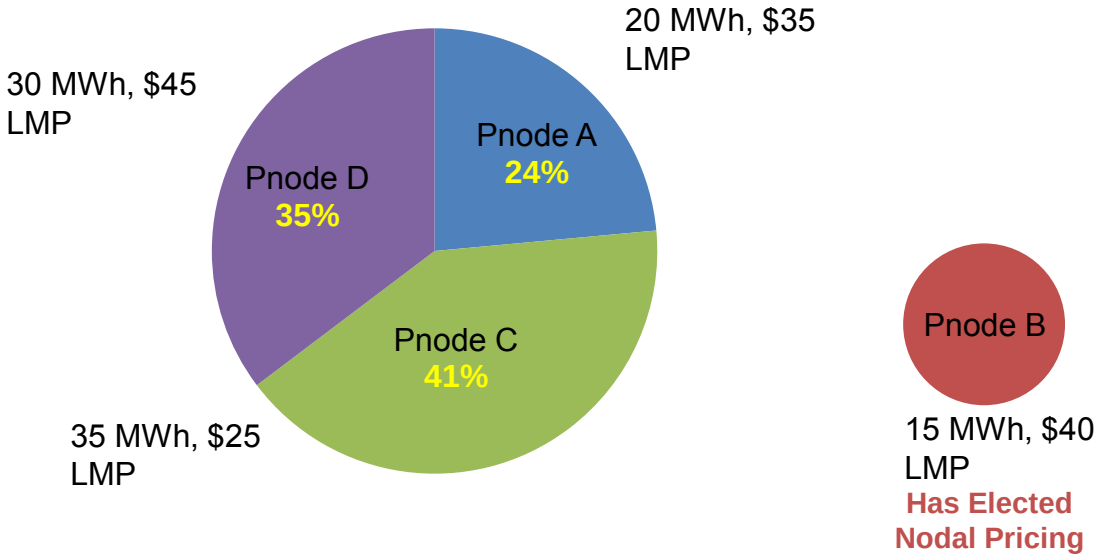
Nodal Load Impact on Physical Zone Price

Physical Zone Definition



Total Zone Load Charges: $ 3525
Physical Zone LMP: $ 35.25

Residual Zone Definition



Total Zone Load Charges: $ 3525
Residual Metered Load LMP: $ 34.41

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Real-Time Load Settlement Examples

Pnode	MWh	LMP	Total Zone Load Charges	Zonal Distribution	Weighted Physical Zone LMP	Residual Distribution	Weighted Residual LMP
A	20	35	$ 700	20%	$ 7.00	23.5%	$ 8.22
B	15	40	$ 600	15%	$ 6.00		$ -
C	35	25	$ 875	35%	$ 8.75	41.2%	$ 10.30
D	30	45	$ 1,350	30%	$ 13.50	35.3%	$ 15.89
Total	**100**		**$ 3,525**	**100%**	**$ 35.25**	**100%**	**$ 34.41**

Settlements Today

- 15 MWh load priced nodally at Pnode B
  - 15 MW * $40 = $600
- Remaining 85 MWh load priced at physical zone
  - 85 MWh * $35.25 = $2996.25
- Residual EDC and/or POLR load pays difference
  - 100 MWh – 15 MWh – 85 MWh = 0 MWh
  - $3525 - $600 - $2996.25 = ($71.25)

Residual Metered Load Aggregate Pricing Implementation

- 15 MWh load priced nodally at Pnode B
  - 15 MW * $40 = $600
- Remaining 85 MWh load priced at Residual Metered Load aggregate
  - 85 MW * $34.41 = $2925
- Residual EDC and/or POLR load pays difference
  - 100 MWh – 15 MWh – 85 MWh = 0 MWh
  - $3525 - $600 - $2925 = $0

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Nodal Pricing

- Currently 4% of Total PJM Load is priced Nodally
- Loads that elect Nodal Pricing must:
  - Provide Advanced Notification, up to 8 months of lead time, of request to move to nodal pricing
  - Ensure hourly metering is available that clearly separates the customer's load from other load on the identified bus or buses
- Qualifying loads move to nodal price load settlement on June 1 of each year to coincide with the PJM planning year
- Election of nodal settlement is permanent unless the physical interconnection infrastructure changes or there is intervention order by FERC
- See Manual 27, Sections 5.6 and 5.7 for business rules

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Impact to Day-Ahead Market

- Day-Ahead Demand Bids will only be permitted at nodal or residual aggregates starting 6/1/2015
  - All participants who have access to submit fixed or price sensitive demand bids at a zonal location will automatically be given access to submit at the corresponding residual location.
- Day-ahead distribution factors will default to the final real-time distribution factors for the residual metered load aggregate at 8:00 a.m. one week prior to the Operating Day
  - i.e., if next Operating Day is Monday, the default distribution is from 8:00 a.m. on Monday of the previous week.
  - Consistent with physical zones, the definition will apply to all hours in the day

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Impact to Real-Time Energy Market

- Preliminary LMPs will be calculated using the same Residual Metered Load distribution factors used for the Day-ahead market for the Operating Day
  - 5 minute LMPs
  - Daily RT LMP file (posted next business day)
- Final hourly real-time distribution factors will be calculated using InSchedule-submitted nodal load MWh
  - Factors are posted during the month in MSRS (Zonal Aggregate Definitions Report)
  - Monthly RT LMP files (posted on 5th business day of next month)

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Impact to InSchedule Contracts

- InSchedule contracts for real-time load currently priced at non-nodal pricing points must use the Residual Metered Load aggregate starting 6/1/2015
  - PJM set all contracts using zonal pricing points to terminate on 6/1/2015
  - EDCs/LSEs must create new real-time load InSchedule contracts using the Residual Metered Load aggregates effective 6/1/2015 and beyond
- Internal Bilateral Transactions can still use the zonal pricing points

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Impact to ARRs

- ARRs will sink at the pricing point where the load is settled
  - Loads priced at the Residual Metered Load aggregate have the option to choose to sink at the physical zone
  - LSEs can decide to be priced at the physical zone on a zone by zone basis
  - Notification was requested by November 1

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Impact to FTR

- Residual Metered Load aggregate definitions used for ARR/FTR purposes are fixed for the planning period
- These definitions will be determined based on the contribution of each bus to the total residual load at the time of previous year's PJM annual peak
  - Consistent with the practice used to determine the physical zone distribution used for ARRs/FTRs
- Any Long Term FTRs already sold for the 15/16 planning period and forward will remain at the physical zone
- Members can choose to buy FTRs at the Residual Metered Load aggregates or Physical zone but any self-scheduled FTRs will match the pricing point of the original ARR

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Impact to Load Response

- Starting 6/1/2015, all Economic and Emergency registrations must select the pricing point at which the corresponding load is settled
  - Nodal or Residual Metered Load aggregate
- In early May, PJM will terminate all Economic Registrations as of 5/31/2015
- CSPs will be responsible for creating new registrations using the new Residual Metered Load aggregates effective 6/1/2015
  - All locations in a aggregate registration must have the same pricing point

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Impact to Reconciliation Settlements

- Differences between Nodal Customers' InSchedule Load (next day) and Reconciled Load (2 months later) may result in RT load distributions being slightly different than the original distributions.
- An adjusted distribution reconciliation rate will be used to reconcile all load priced at the Residual Metered Load aggregate, including load with no reconciliation MWh
    - Only impacts load reconciliation for transmission congestion and transmission losses
- The adjusted distribution reconciliation rate will be posted publicly and reported in MSRS

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Residual Metered Load Aggregate Pricing Settlements

Pnode	Original MWh	LMP	Total Zone Load Charges	Residual Metered Load Agg Distribution	Weighted Residual Metered Load Agg LMP	Net MWh after reconciliation	Revised Residual Metered Load Agg Distribution	Revised Weighted Residual Metered Load Agg LMP
A	20	35	$ 700	23.5%	$ 8.22	20	23.26%	$ 8.14
B	15	40	$ 600		$ -	14 (nodal) 1 (residual)	1.16%	$ 0.46
C	35	25	$ 875	41.2%	$ 10.30	35	40.7%	$ 10.18
D	30	45	$ 1,350	35.3%	$ 15.89	30	34.88%	$ 15.70
Total	**100**		**$ 3,525**	**100%**	**$ 34.41**	**100**	**100%**	**$ 34.48**

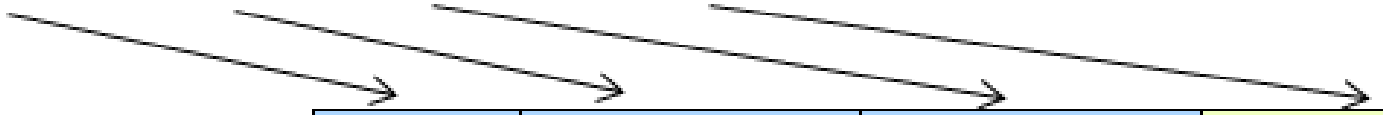
	Original Settlement	Reconciliation Settlement	Net Settlement
Nodal Load	15 MWh load priced at Pnode B 15 MW * $40 = $600	1 MWh less load priced at Pnode B -1 MWh * $40 = ($40)	14 MWh * $40 = $560 $600 + ($40) = $560
Remaining Load	Remaining 85 MWh load priced at residual metered load aggregate 85 MW * $34.41 = $2925	Adjusted Distribution Reconciliation Rate = $34.48 - $34.41 = $0.07 1 MWh more load priced at RML Aggregate 1MWh * ($34.41 + $0.07) = $34.48 85 MWh original load priced at Adj Distr. Recon Rate 85MWh * ($0.07**) = $5.52 $34.48 + $5.52 = $40	86 MWh * $34.48 = $2965 $2925 + $40 = $2965
EDC / POLR Load	Residual EDC and/or POLR load pays difference 100 MWh – 15 MWh – 85 MWh = 0 MWh $3525 - $600 – $2925= $0	Residual EDC and/or POLR load pays difference 1 MWh + -1 MWh = 0 MWh $40 + ($40) = $0	$0+ $0 = **$0**

** Note: Unrounded distribution weightings and prices must be used to recalculate these settlements

Submitting Reconciliation Data during Transition

- Load Reconciliation data is submitted in InSchedule two months after the operating month
- Load Submissions will need to reference the appropriate contract ID relative to the given data's effective range

Operating Month	March 2015	April 2015	May 2015	June 2015	July 2015	August 2015
Contract ID	1234	1234	1234	5678	5678	5678
Pricing Point	PECO	PECO	PECO	PECO_RESID_AGG	PECO_RESID_AGG	PECO_RESID_AGG



Reconciliation Data is Due No Later Than	5/31/2015	6/30/2015	7/31/2015	8/31/2015
Reference Contract ID	1234	1234	1234	5678

Note: EDCs are required to use the new Contract ID for Real-Time Load assignments in June and July but refer to the old Contract ID when submitting reconciliation during those months for April and May.

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Informational Data Postings

- Physical zone prices will continue to be calculated and published after 6/1/2015
- Residual Metered Load Prices are currently being calculated for informational purposes and are posted in a separate "residual" file
  - DA: http://www.pjm.com/markets-and-operations/energy/day-ahead/lmpda.aspx
  - Preliminary RT: http://www.pjm.com/markets-and-operations/energy/real-time/lmp.aspx
  - Final RT: http://www.pjm.com/markets-and-operations/energy/real-time/monthlylmp.aspx
- Sample files that mimic the expected LMP file formats once the residual prices become biddable points on 6/1/2015 are available on the Residual Metered Load Pricing page of pjm.com
- Due to the AEP Fully Metered EDC transition, also set for 6/1/2015, representative LMPs have been posted for informational purposes on the LMP Model Information page.

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Reference Materials

- Residual Metered Load Aggregate Pricing page on PJM.com
  - FAQ document
  - Overview presentation
  - Link to Issue Tracking
  - Updated Zonal Vs. Nodal Load Percentages by EDC
- Additional Training session:
  - May 14, 2015 1 - 3 PM Eastern

Any Additional Questions can be sent to: mss@pjm.com

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Manual References

- Manual 28 – Operating Agreement Accounting
  - Residual Metered Load calculation and Residual Metered Load Aggregate Definitions (Section 3)
  - Transmission Congestion Charge and Transmission Loss Charge Reconciliation (Section 8.3 and Section 9.3)
- Manual 11 – Energy & Ancillary Services Market Operations
  - Default day-ahead definition for residual metered load aggregate (Section 2)
- Manual 6 – ARR/FTR election language (Sections 3 and 4)

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