



Load Serving Entities LSE201



2026_08 LSE 201



Greetings
and
Introductions

Attendance

Questions

Presentation materials

Recording for internal purposes

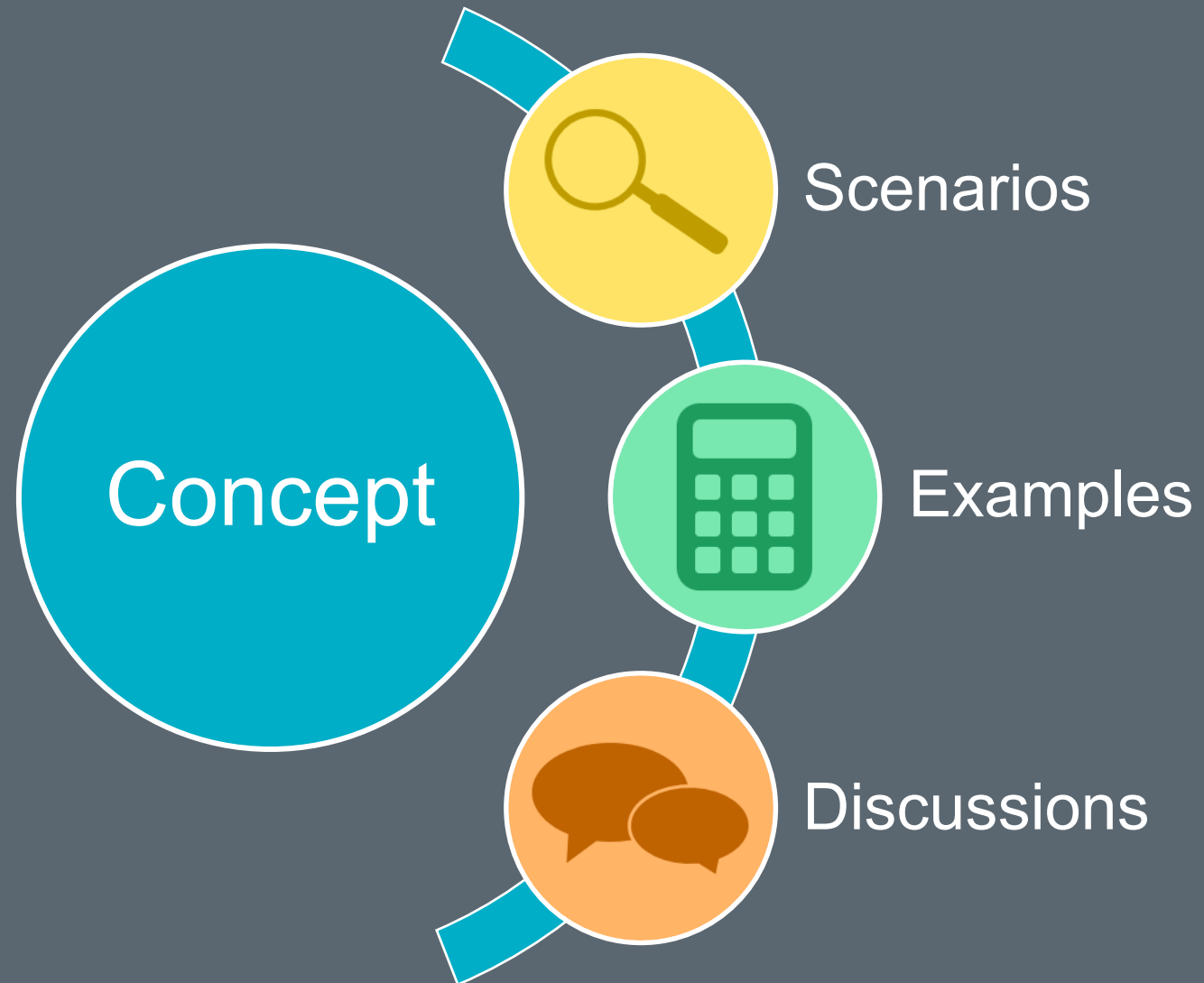


PROTOCOL DISCLAIMER

This presentation provides a general overview of the Texas Nodal Market and is not intended to be a substitute for the ERCOT Protocols, as amended from time to time. If any conflict exists between this presentation and the ERCOT Protocols, the ERCOT Protocols shall control in all respects.

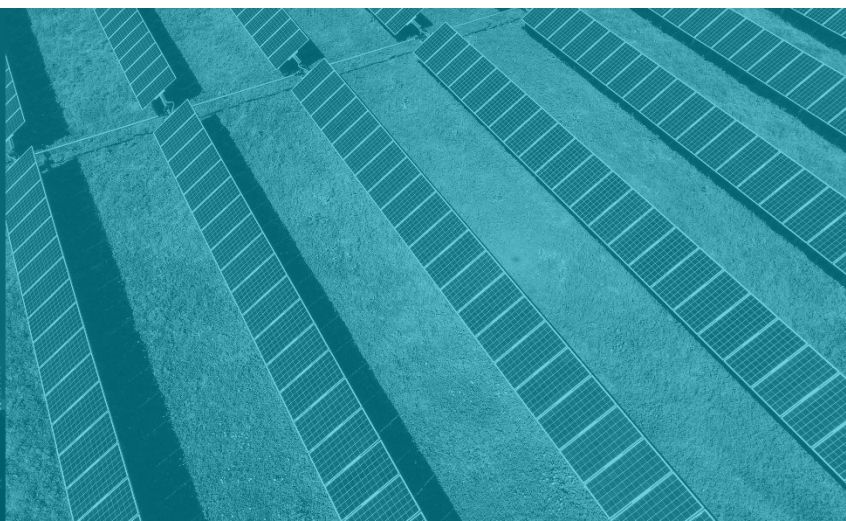
For more information, please visit:

<http://www.ercot.com/mktrules/nprotocols/>





Introduction





You have Load to serve during Hour 1500:

- 100 MW forecast at the West Load Zone
- Pricing data provided
 - Recent Real-Time prices
 - Available forward prices

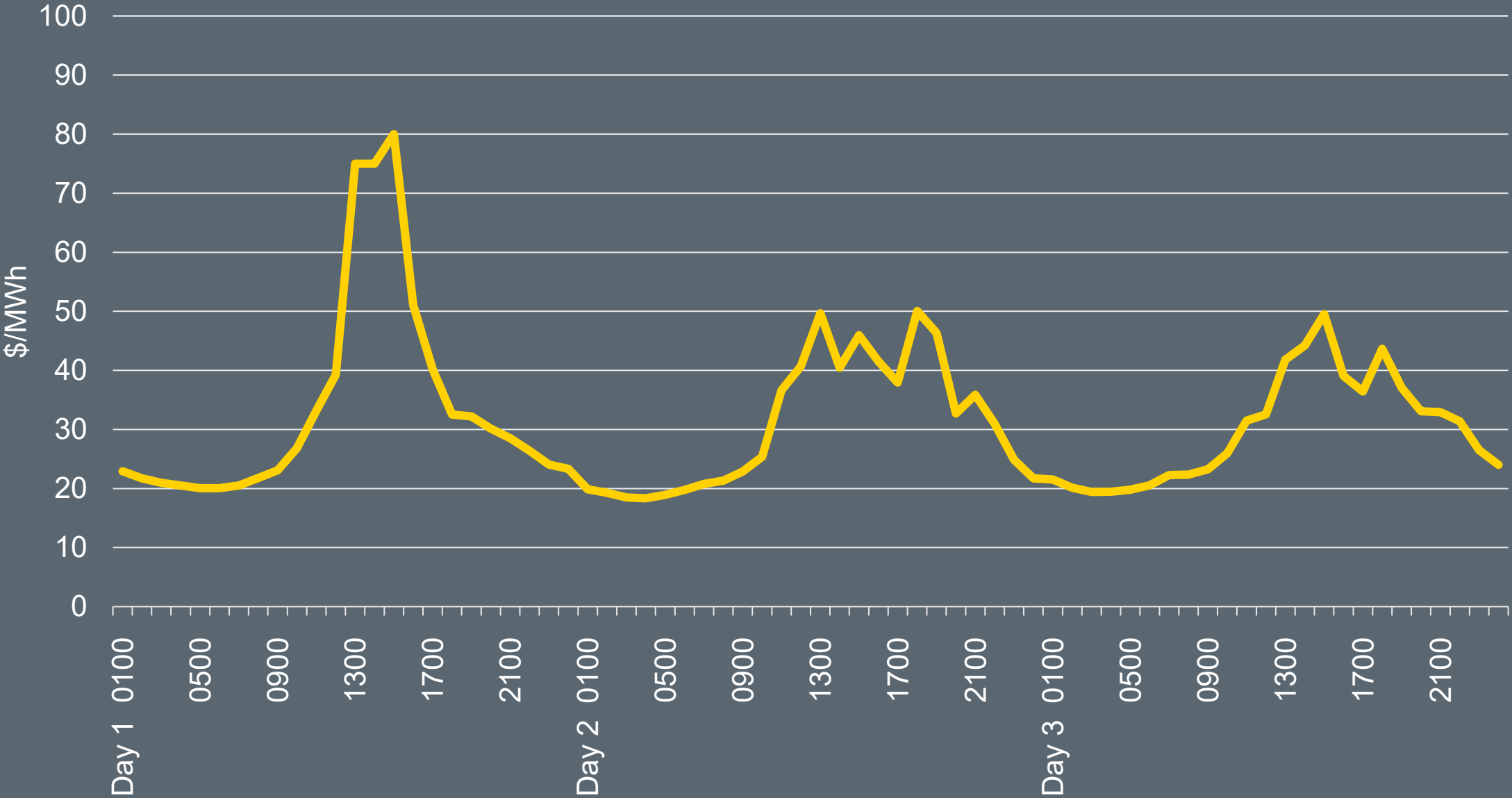
You must choose:

- Buy one of the forward prices
- Buy in Real-Time Market



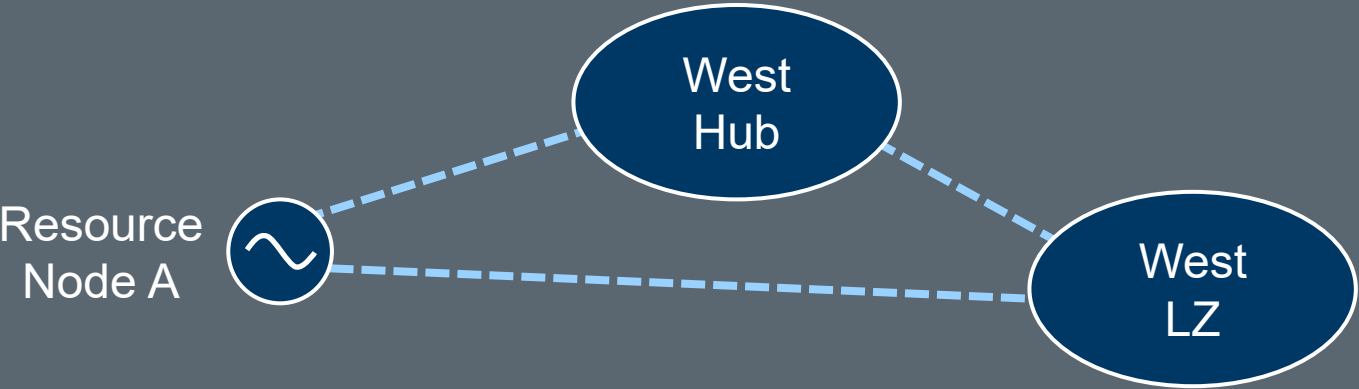


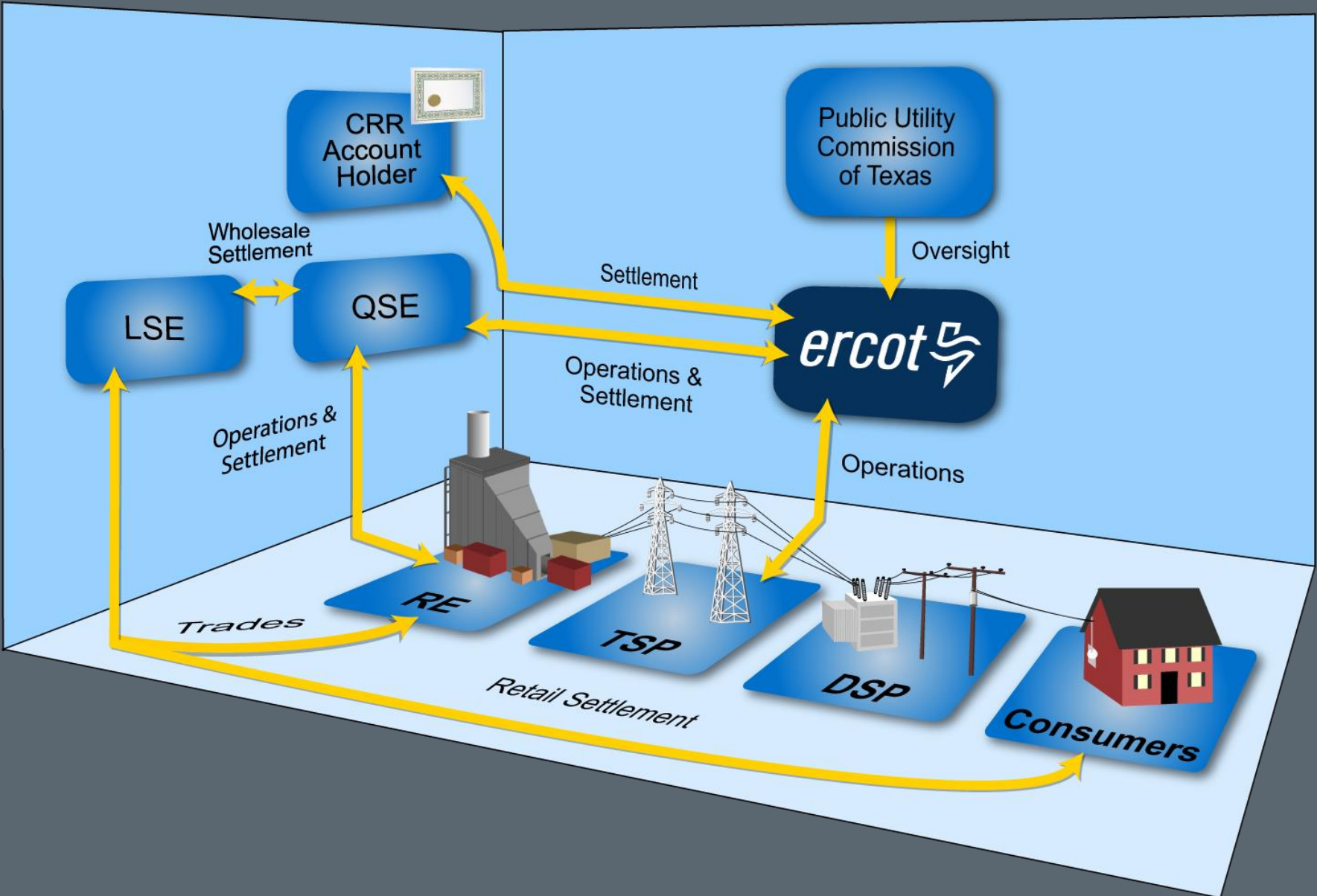
Recent Real-Time Prices for the West Load Zone





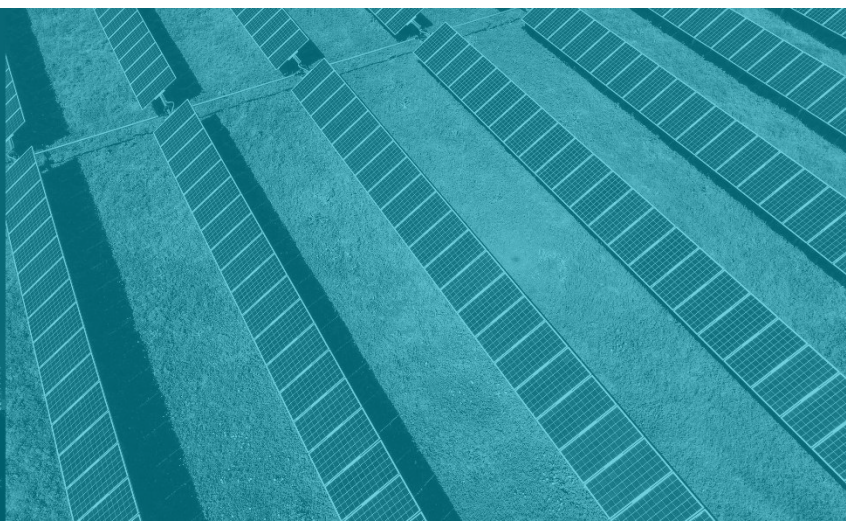
	Resource Node A	West Hub	West Load Zone
Bilateral Trade	\$45/MWh	\$50/MWh	\$60/MWh
Day-Ahead Market	\$40/MWh	\$50/MWh	\$52/MWh
Real-Time Market	\$35/MWh	\$45/MWh	\$55/MWh







Tools for Hedging Wholesale Market Costs

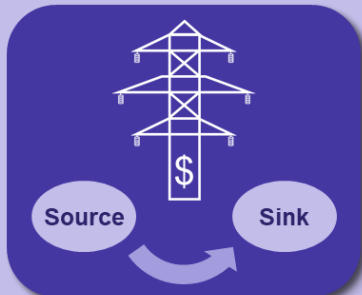




Day-Ahead Market



Bilateral Trades



Congestion Revenue Rights

Introducing ...

Friendly Power, LLP



Business Goals

- Provide reliable electric service at a competitive rate
- Manage cost exposure

Comparing Forward & Real-time transactions

- Day-Ahead Market & Trades transact in hourly MWs
- Real-Time Market settles in 15-minute MWhs

For simplicity, we will

- Calculate all scenarios in hourly MWs
- Assume Real-Time prices and loads are constant for an hour

Costs

Energy

Congestion

Ancillary Services

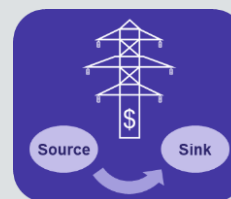
Tools



Day-Ahead Market



Bilateral Trades



CRRs



Friendly Power, LLP

Does not hedge for Hour 1200

- Buys all energy in Real-Time Market
- 100 MW load in West Load Zone
- \$40 Real-Time Price



Real-Time Energy Imbalance

$$= (-1) \left(\left(\text{SUPPLIES} \right) - \left(\text{OBLIGATIONS} \right) \right) * \text{RTSPP}$$



RTSPP = Real-Time Settlement Point Price

Real-Time Energy Imbalance at a Load Zone

$$= (-1) \left[\begin{array}{c} \text{DAM Energy Purchases} \\ + \\ \text{Trade Energy Purchases} \end{array} \right] - \left[\begin{array}{c} \text{DAM Energy Sales} \\ + \\ \text{Trade Energy Sales} \\ + \\ \text{Metered Load} \end{array} \right] * \text{RTSPP}$$

Supplies Obligations



Each Settlement Point
settled separately

Real-Time Energy Imbalance at a Resource Node

$$= (-1) \left[\begin{array}{c} \text{Metered Generation} \\ + \\ \text{DAM Energy Purchases} \\ + \\ \text{Trade Energy Purchases} \end{array} \right] - \left[\begin{array}{c} \text{DAM Energy Sales} \\ + \\ \text{Trade Energy Sales} \end{array} \right] * \text{RTSPP}$$

Supplies Obligations



Each Settlement Point
settled separately

Real-Time Energy Imbalance at a Hub

$$= (-1) \left(\begin{array}{c} \text{DAM Energy Purchases} \\ + \\ \text{Trade Energy Purchases} \end{array} \right) - \left(\begin{array}{c} \text{DAM Energy Sales} \\ + \\ \text{Trade Energy Sales} \end{array} \right) * \text{RTSPP}$$

Supplies Obligations



Each Settlement Point
settled separately



Real-Time Energy Imbalance at the West Load Zone

$$= (-1) \left(\begin{array}{c} \text{DAM Energy Purchases} \\ + \\ \text{Trade Energy Purchases} \end{array} \right) - \left(\begin{array}{c} \text{DAM Energy Sales} \\ + \\ \text{Trade Energy Sales} \\ + \\ \text{Metered Load} \end{array} \right) * \text{RTSPP}$$

$$= (-1) \left(\left(\right) - \left(\right) \right) * \$40/\text{MWh}$$

=

Real-Time Energy Imbalance offers ideas

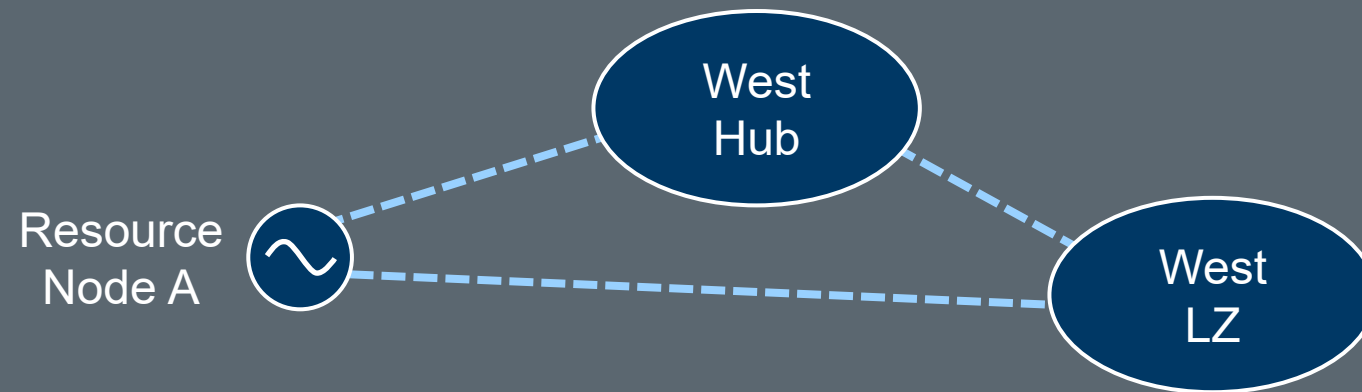
$$= (-1) \left(\left(\text{SUPPLIES?} \right) - \left(\text{Metered Load} \right) \right) * \text{RTSPP}$$

... but what are the Potential Risks



Price Matrix for Hour 1200 (Wednesday)

	Resource Node A	West Hub	West Load Zone
Bilateral Trade	\$50/MWh	\$55/MWh	\$60/MWh
Day-Ahead Market	\$45/MWh	\$47/MWh	\$50/MWh
Real-Time Market	\$30/MWh	\$35/MWh	\$40/MWh



Costs

Energy

Congestion

Ancillary Services

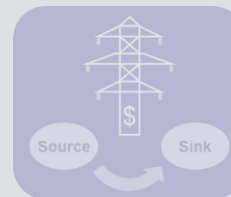
Tools



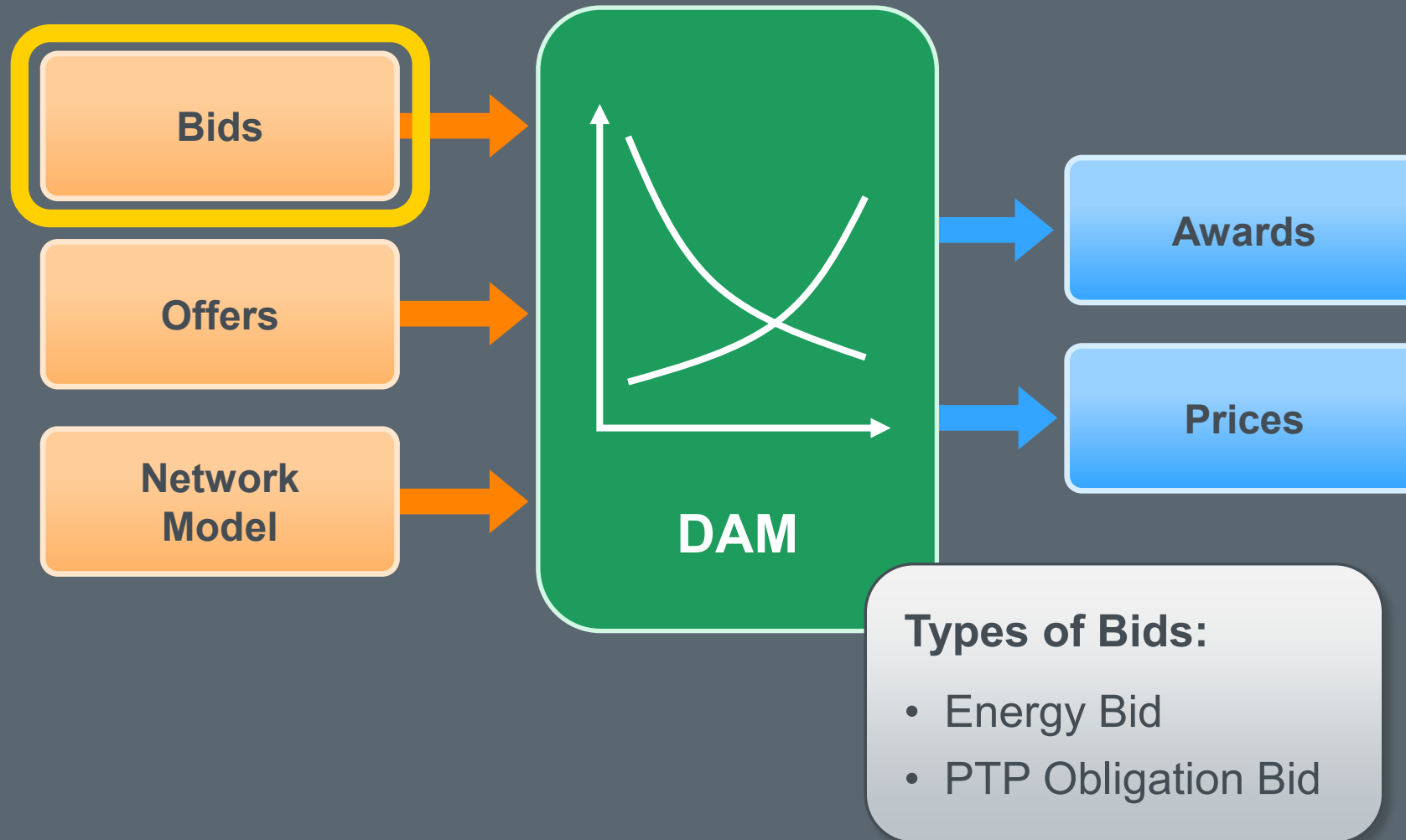
Day-Ahead Market



Bilateral Trades

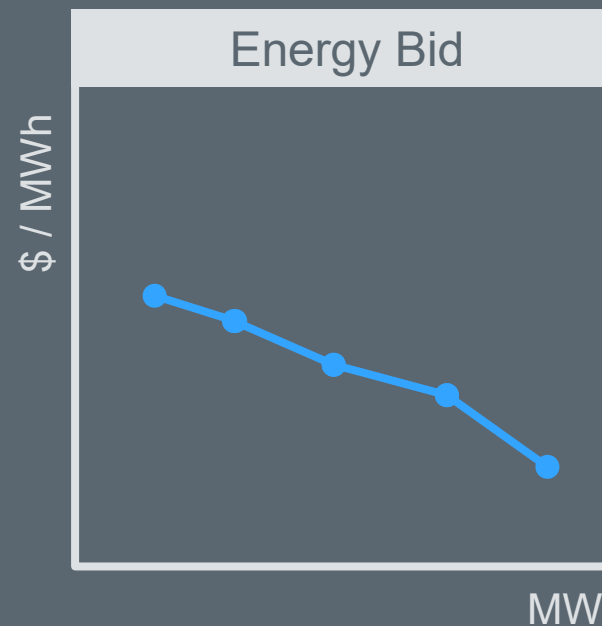


CRRs



Day-Ahead Market Energy Bid

- Proposal to buy energy in DAM
- Submitted at any Settlement Point



Financial credit in Real-Time Market

Charge for awarded Energy Bid

$$= \text{Awarded MW} * \text{DASPP}$$

Payment for awarded Energy Offer

$$= (-1) * \text{Awarded MW} * \text{DASPP}$$



DASPP = Day-Ahead Settlement Point Price



Friendly Power, LLP

DAM Energy Award for Hour 1200

- 100 MW award in West Load Zone
- 100 MW load in West Load Zone



$$\begin{aligned}\text{Charge} &= 100 \text{ MW} * \$50/\text{MWh} \\ &= \$5000 \text{ per hour}\end{aligned}$$



Real-Time Energy Imbalance at the West Load Zone

$$= (-1) \left(\left(\begin{array}{c} \text{DAM Energy Purchases} \\ + \\ \text{Trade Energy Purchases} \end{array} \right) - \left(\begin{array}{c} \text{DAM Energy Sales} \\ + \\ \text{Trade Energy Sales} \\ + \\ \text{Metered Load} \end{array} \right) \right) * \text{RTSPP}$$

$$= (-1) \left(\left(\quad \right) - \left(\quad \right) \right) * \$40/\text{MWh}$$

=



Example 2: Scorecard

Type of Settlement		Result
Day-Ahead Market	DAM Energy Purchase	\$5000.00
Real-Time Market	Real-Time Energy Imbalance	\$0
NET Cost		\$5000.00

Costs

Energy

Congestion

Ancillary Services

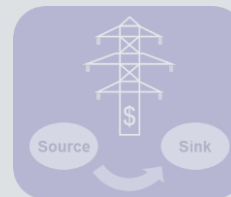
Tools



Day-Ahead Market



Bilateral Trades



CRRs

Decentralized Forward Market

- QSE-to-QSE transactions
- Transfers settlement responsibility
- Buyer and seller must confirm





Friendly Power, LLP

Energy Trade for Hour 1200

- 100 MW trade at West Hub
- 100 MW load in West Load Zone



$$\begin{aligned}\text{Cost} &= 100 \text{ MW} * \$55/\text{MWh} \\ &= \$5500 \text{ per hour}\end{aligned}$$



Real-Time Energy Imbalance at the West Hub

$$= (-1) \left(\left(\begin{array}{c} \text{DAM Energy Purchases} \\ + \\ \text{Trade Energy Purchases} \end{array} \right) - \left(\begin{array}{c} \text{DAM Energy Sales} \\ + \\ \text{Trade Energy Sales} \end{array} \right) \right) * \text{RTSPP}$$

$$= (-1) \left(\left(\quad \right) - \left(\quad \right) \right) * \$35/\text{MWh}$$

=



Real-Time Energy Imbalance at the West Load Zone

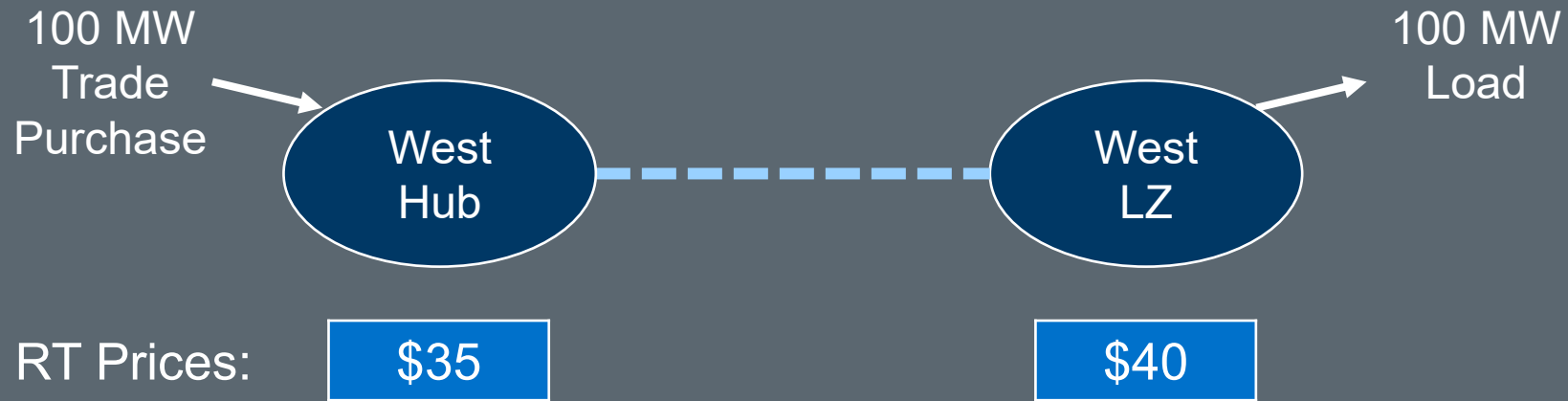
$$= (-1) \left(\left(\begin{array}{c} \text{DAM Energy Purchases} \\ + \\ \text{Trade Energy Purchases} \end{array} \right) - \left(\begin{array}{c} \text{DAM Energy Sales} \\ + \\ \text{Trade Energy Sales} \\ + \\ \text{Metered Load} \end{array} \right) \right) * \text{RTSPP}$$

$$= (-1) \left(\left(\quad \right) - \left(\quad \right) \right) * \$40/\text{MWh}$$

=



Net Real-Time Energy Imbalance



Payment at Hub	Charge at Load Zone	Net Amount



Example 3: Scorecard

Type of Settlement		Result
Day-Ahead Market	DAM Energy Purchase	N/A
Real-Time Market	Real-Time Energy Imbalance	\$500.00
<i>Net ERCOT Settlement</i>		\$500.00
Energy Trade	Cost to LSE for Energy Traded	\$5500.00
NET Cost		\$6000.00

Costs

Energy

Congestion

Ancillary Services

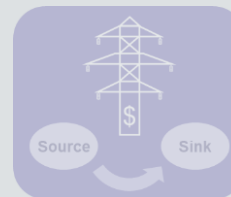
Tools



Day-Ahead Market



Bilateral Trades

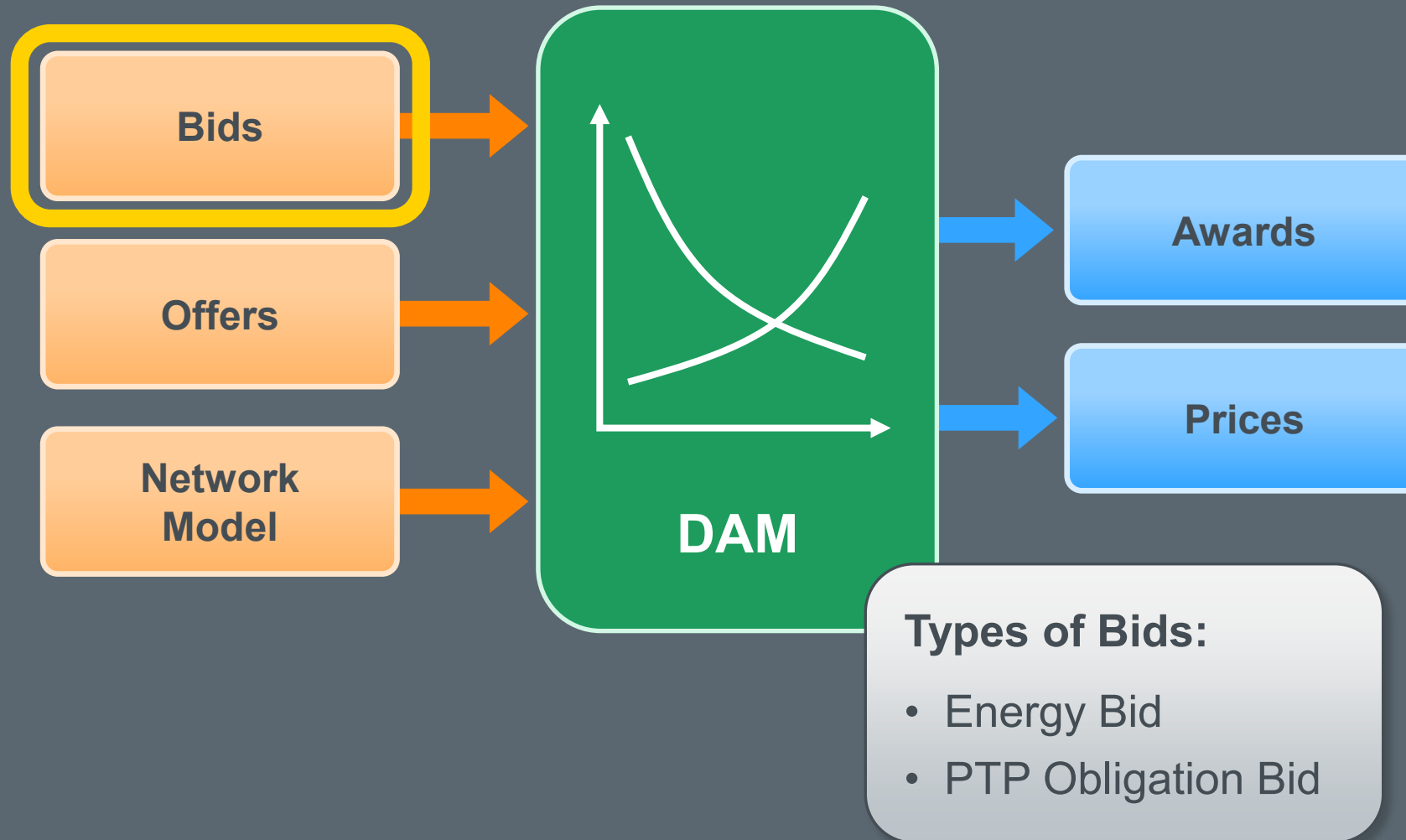


CRRs



Hourly Financial instruments

- Purchased at DAM price spread
- Settled at Real-Time price spread



Submitted between any two Settlement Points

Source	Sink	Bid	
West Hub	West Load Zone	MW	\$ / MW
Resource Node A	West Load Zone	MW	\$ / MW
Resource Node A	West Hub	MW	\$ / MW
West Hub	Resource Node A	MW	\$ / MW



Payment or charge in Real-Time



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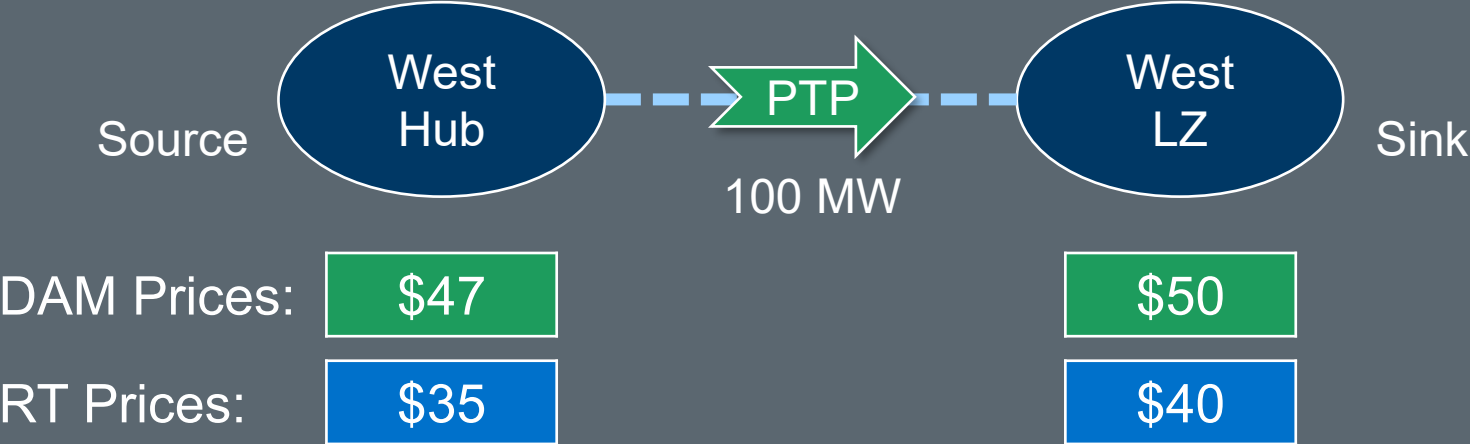
100 MW Transactions for Hour 1200

- DAM PTP Obligations West Hub to West Load Zone
- Trade Energy Purchase at West Hub





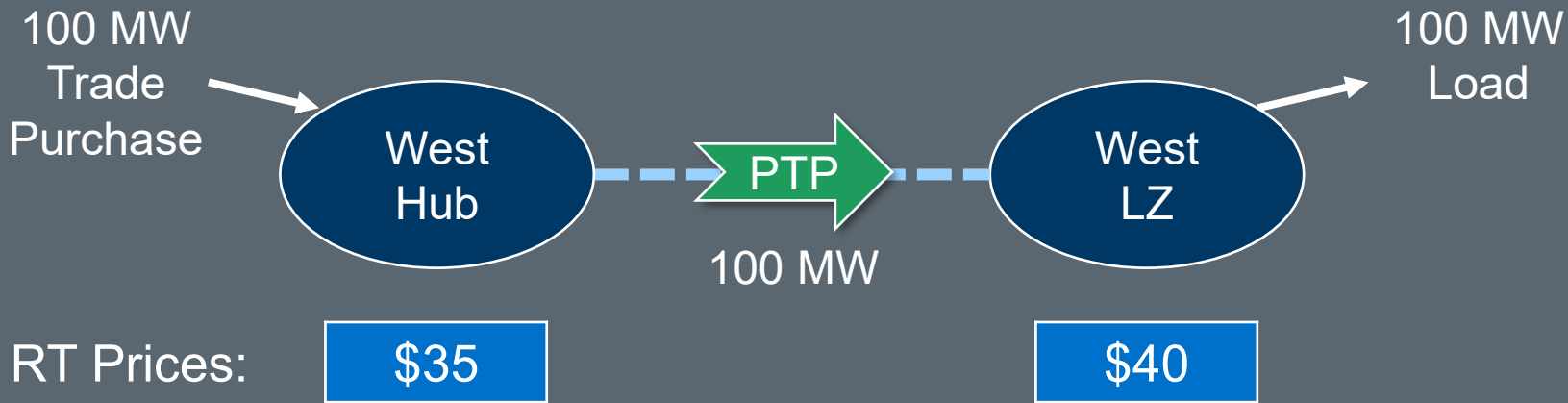
Day-Ahead Market Point-to-Point Obligations



Settlement	Sink minus Source Price	PTP Obligation Amount
DAM		
RT		



Real-Time Settlement



Payment at Hub	Charge at Load Zone	Payment for PTP Obligation	Net Amount



Example 4: Scorecard

Type of Settlement		Result
Day-Ahead Market	DAM Energy Purchase	N/A
	Charge for DAM PTP Obligation	\$300.00
Real-Time Market	Real-Time Energy Imbalance	\$500.00
	Payment for DAM PTP Obligation	-\$500.00
Net ERCOT Settlement		\$300.00
Energy Trade	Cost to LSE for Energy Traded	\$5500.00
NET Cost		\$5800.00

Costs

Energy

Congestion

Ancillary Services

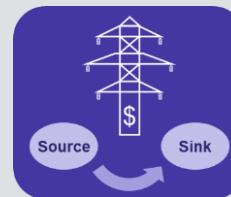
Tools



Day-Ahead Market

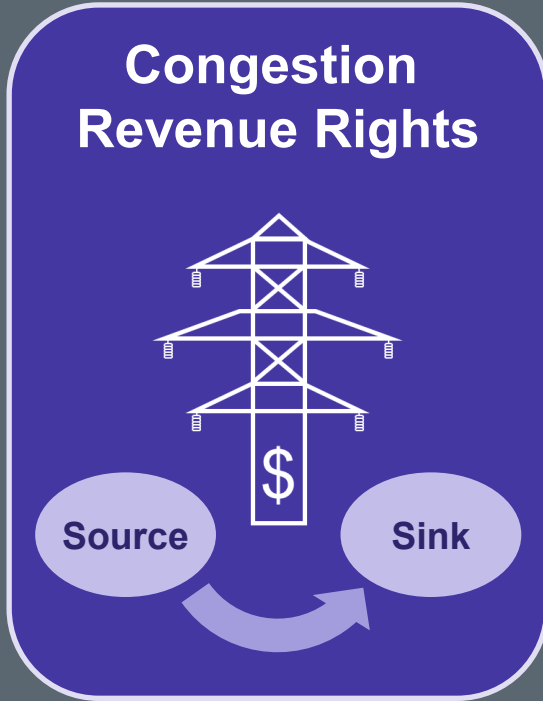


Bilateral Trades



CRRs

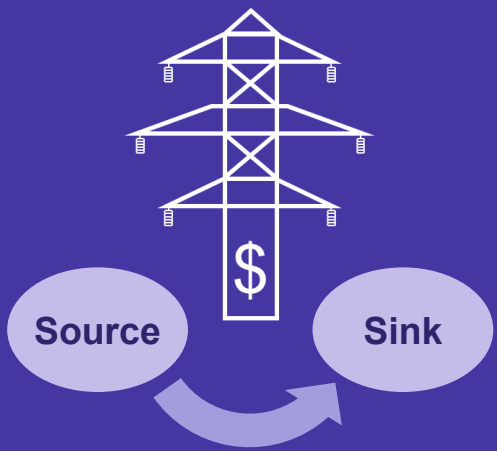
Congestion Revenue Rights



Monthly Financial instruments

- Purchased at Auction Price
- Settled at DAM price spread

Congestion Revenue Rights



Two types of instruments

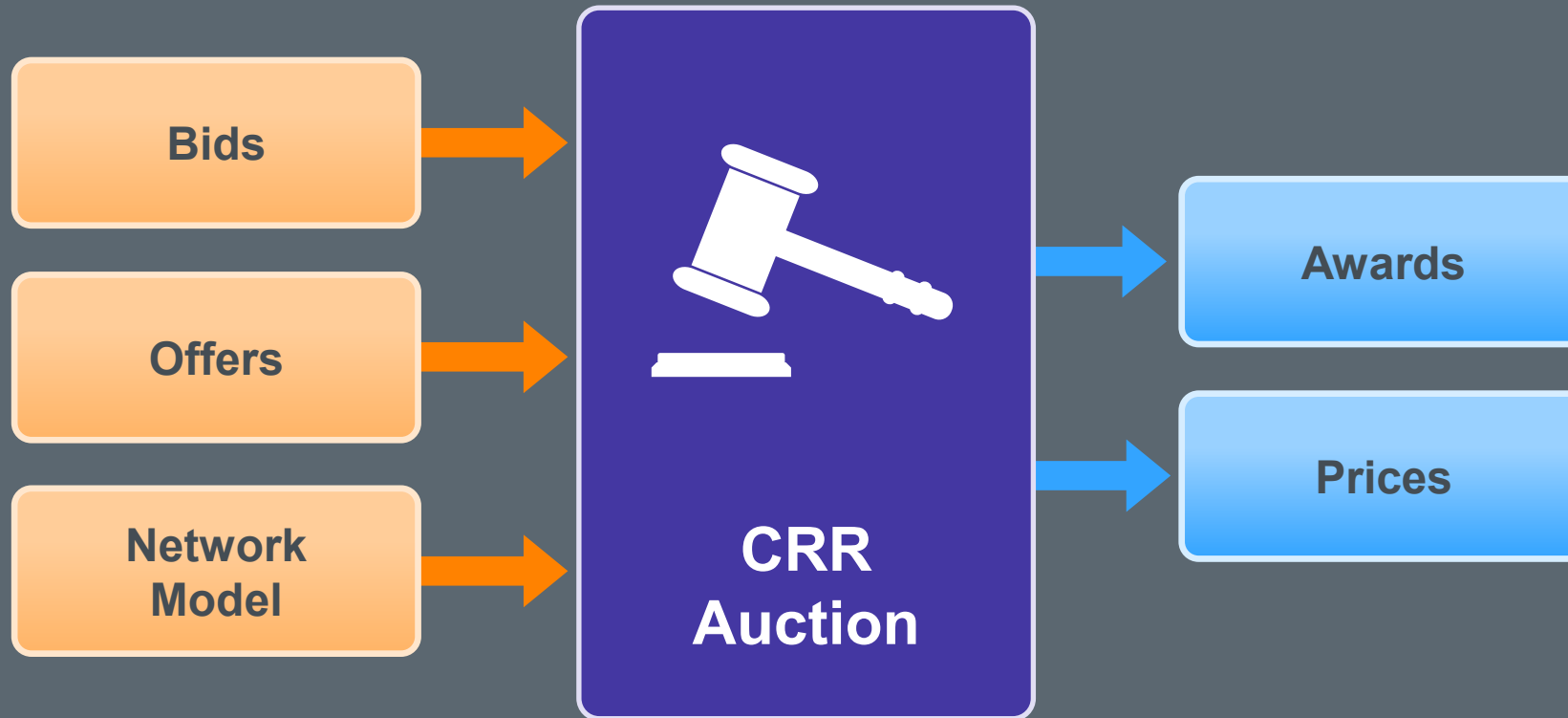
Point-to-Point Obligation

Payment or Charge in DAM

Point-to-Point Option

Payment only in DAM

CRR Auction Transactions



CRR Auctions take place twice per month:

- Monthly Auction
- Long-Term Auction Sequence (LTAS)
 - Six-month timeframe (Jan - June or July - Dec)
 - Six Sequences (3 years)
 - One Auction per month





Friendly Power buys CRRs in Monthly Auction



Which Time-of-Use Block?

Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Off-Peak (0100 – 0600)						
Peak Weekday (0700 – 2200)					Peak Weekend (0700 – 2200)	
Off-Peak (2300 – 0000)						



	Resource Node A	West Hub	West Load Zone
Bilateral Trade	\$50/MWh	\$55/MWh	\$60/MWh
Day-Ahead Market	\$45/MWh	\$47/MWh	\$50/MWh
Real-Time Market	\$30/MWh	\$35/MWh	\$40/MWh

Peak Weekday PTP Option	Auction Price
West Hub to West Load Zone	\$2/MWh
Resource Node A to West Load Zone	\$3/MWh



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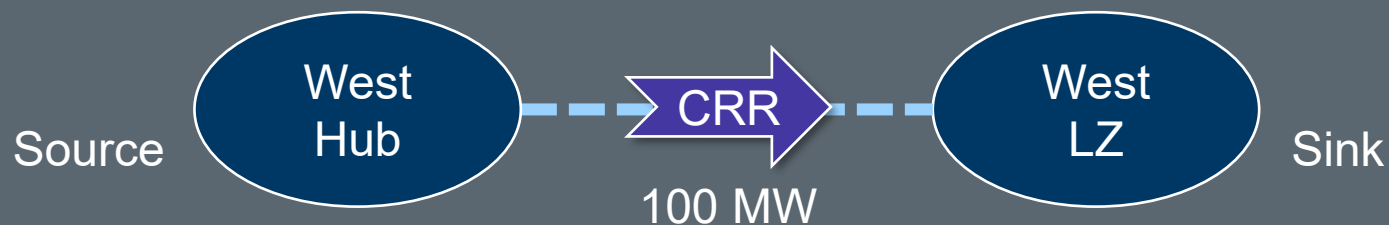
100 MW Transactions for Hour 1200

- Peak Weekday PTP Options West Hub to West Load Zone
- Trade Energy Purchase at West Hub





CRR Auction Settlement

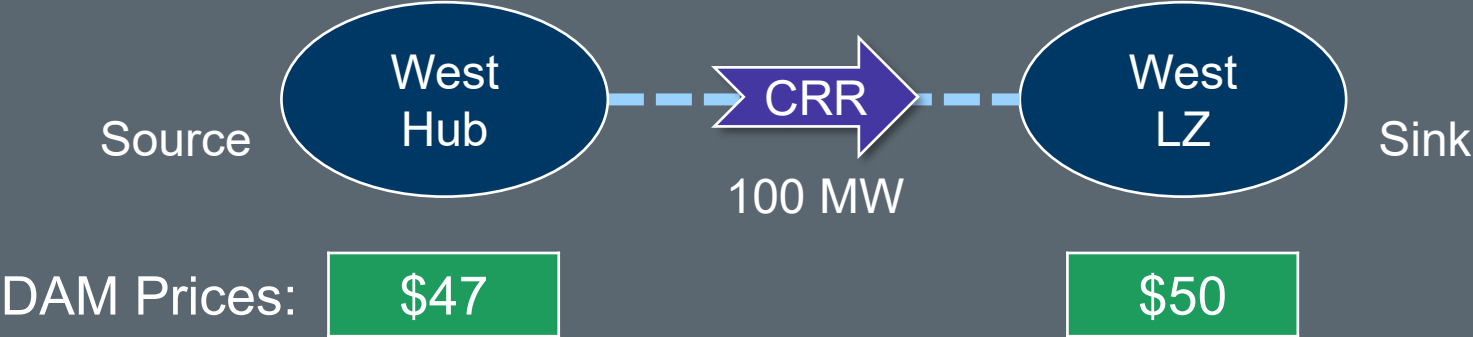


$$\begin{aligned}\text{Cost} &= 100 \text{ MW} * \$2/\text{MWh} \\ &= \$200 \text{ for Hour 1200}\end{aligned}$$

Note: ERCOT will charge CRR buyer for all hours in Time-Of-Use block



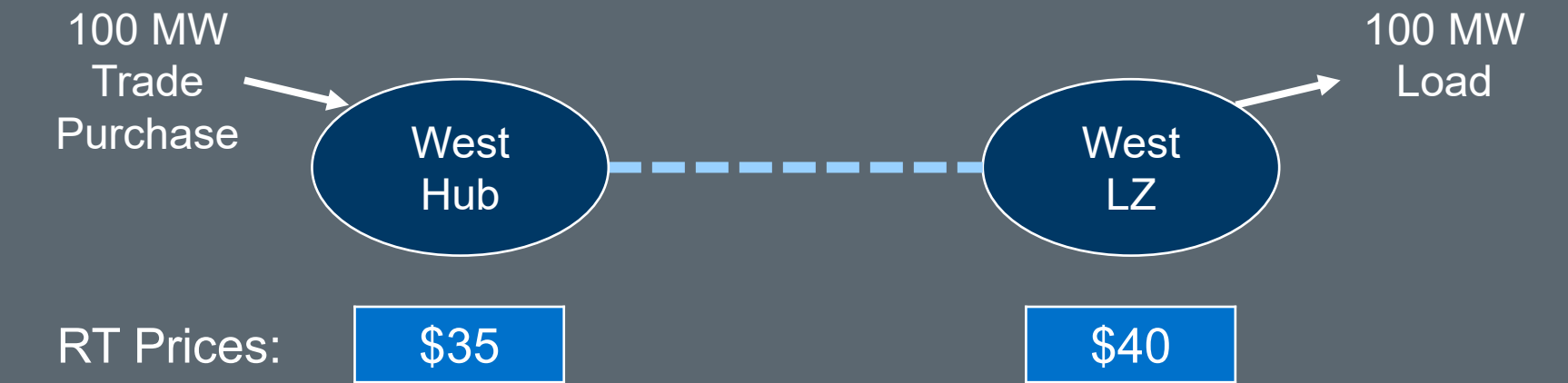
Day-Ahead Market Settlement



Sink minus Source Price	Payment for CRR



Real-Time Settlement

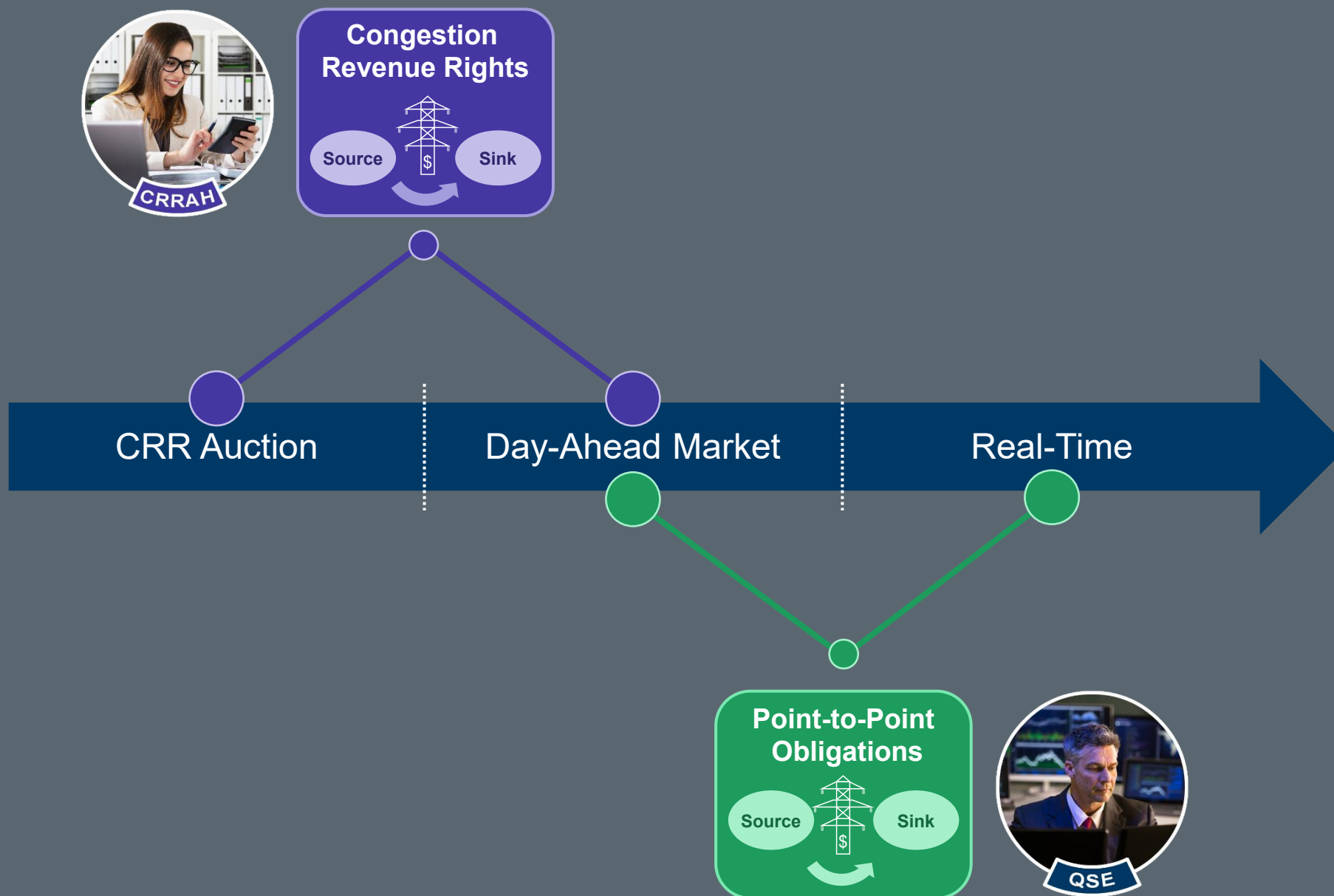


Payment at Hub	Charge at Load Zone	Net Amount



Example 5: Scorecard

Type of Settlement		Result
CRR Auction	Charge for Awarded PTP Option	\$200.00
Day-Ahead Market	DAM Energy Purchase	N/A
	Payment for PTP Option	-\$300.00
	Charge for DAM PTP Obligation	N/A
Real-Time Market	Real-Time Energy Imbalance	\$500.00
	Payment for DAM PTP Obligation	N/A
Net ERCOT Settlement		\$400.00
Energy Trade	Cost to LSE for Energy Traded	\$5500.00
NET Cost		\$5900.00



Costs

Energy

Congestion

Ancillary Services

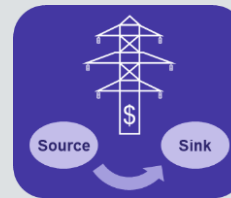
Tools



Day-Ahead Market



Bilateral Trades



CRRs



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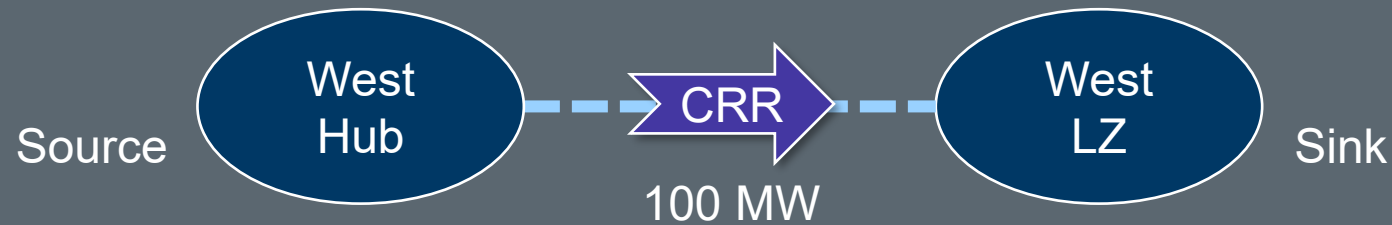


100 MW Transactions for Hour 1200

- Peak Weekday PTP Options West Hub to West Load Zone
- DAM PTP Obligations West Hub to West Load Zone
- Trade Energy Purchase at West Hub



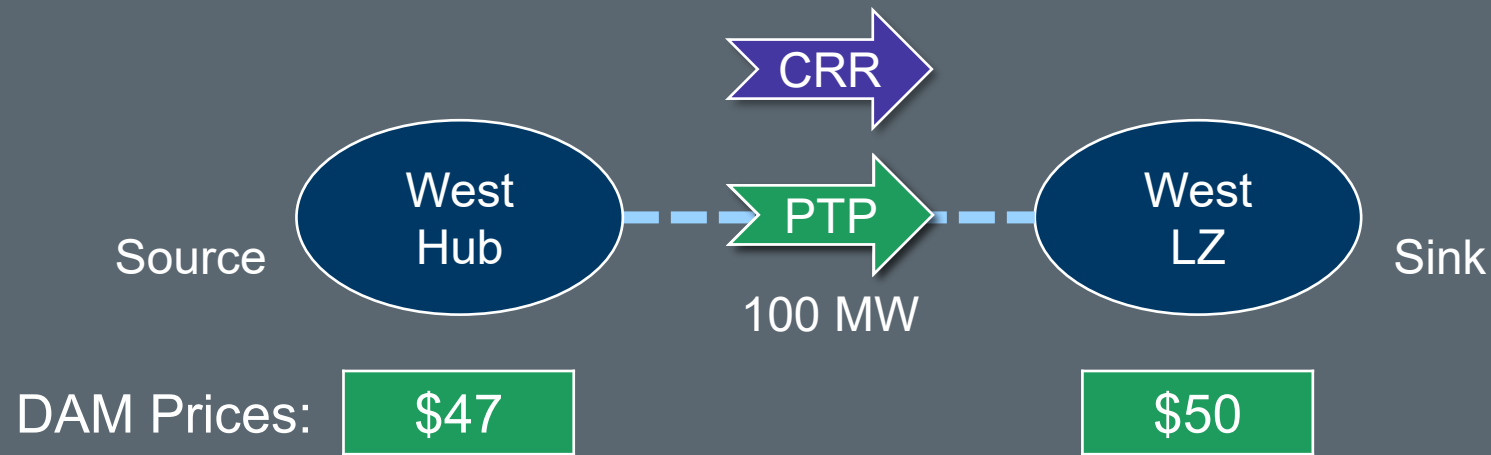
CRR Auction Settlement



$$\begin{aligned}\text{Cost} &= 100 \text{ MW} * \$2/\text{MWh} \\ &= \$200 \text{ for Hour 1200}\end{aligned}$$



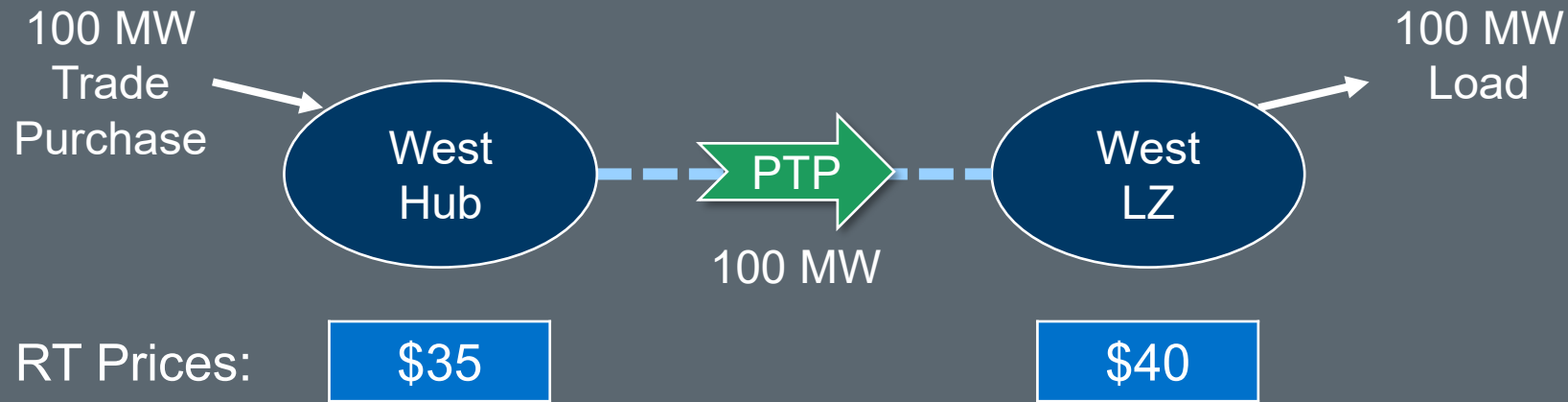
Day-Ahead Market Settlement



Payment for CRR	Charge for PTP Obligation	Net Amount



Real-Time Settlement



Payment at Hub	Charge at Load Zone	Payment for PTP Obligation	Net Amount



Example 6: Scorecard

Type of Settlement		Result
CRR Auction	Charge for Awarded PTP Option	\$200.00
Day-Ahead Market	DAM Energy Purchase	N/A
	Payment for PTP Option	-\$300.00
	Charge for DAM PTP Obligation	\$300.00
Real-Time Market	Real-Time Energy Imbalance	\$500.00
	Payment for DAM PTP Obligation	-\$500.00
Net ERCOT Settlement		\$200.00
Energy Trade	Cost to LSE for Energy Traded	\$5500.00
NET Cost		\$5700.00

Costs

Energy

Congestion

Ancillary Services

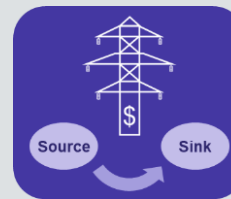
Tools



Day-Ahead Market



Bilateral Trades



CRRs



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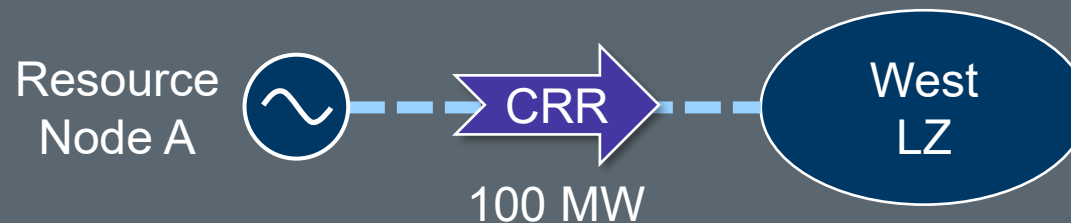
100 MW Transactions for Hour 1200

- Peak Weekday PTP Options Resource Node to West Load Zone
- DAM Energy Purchase at West Load Zone





CRR Auction Settlement

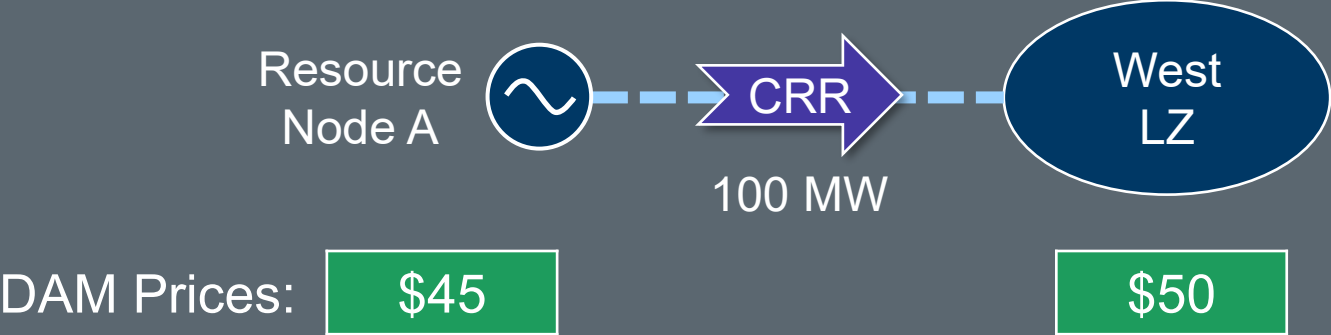


$$\begin{aligned}\text{Cost} &= 100 \text{ MW} * \$3/\text{MWh} \\ &= \$300 \text{ for Hour 1200}\end{aligned}$$

Note: ERCOT will charge CRR buyer for all hours in Time-Of-Use block



Day-Ahead Market Settlement



Energy Charge at Load Zone	Payment for PTP Option	Net Amount



Real-Time Energy Imbalance at the West Load Zone

$$= (-1) \left(\left(\begin{array}{c} \text{DAM Energy Purchases} \\ + \\ \text{Trade Energy Purchases} \end{array} \right) - \left(\begin{array}{c} \text{DAM Energy Sales} \\ + \\ \text{Trade Energy Sales} \\ + \\ \text{Metered Load} \end{array} \right) \right) * \text{RTSPP}$$

$$= (-1) \left(\left(\quad \right) - \left(\quad \right) \right) * \$40/\text{MWh}$$

=



Example 7: Scorecard

Type of Settlement		Result
CRR Auction	Charge for Awarded PTP Option	\$300.00
Day-Ahead Market	DAM Energy Purchase	\$5000.00
	Payment for PTP Option	-\$500.00
	Charge for DAM PTP Obligation	N/A
Real-Time Market	Real-Time Energy Imbalance	\$0.00
	Payment for DAM PTP Obligation	N/A
Net ERCOT Settlement		\$4800.00
Energy Trade	Cost to LSE for Energy Traded	N/A
NET Cost		\$4800.00

Costs

Energy

Congestion

Ancillary Services

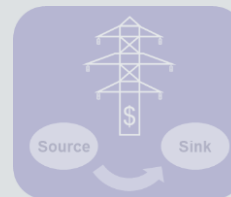
Tools



Day-Ahead Market



Bilateral Trades



CRRs

**ERCOT allocates the AS Plan as
Advisory AS Obligations (by 0600)**

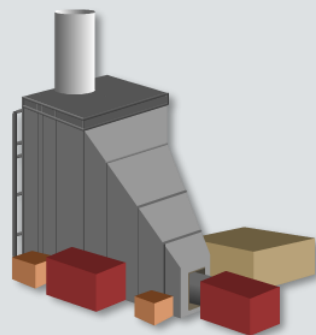
Hourly Quantities

- Regulation Up
- Regulation Down
- Responsive Reserve
- Contingency Reserve
- Non-Spinning Reserve



QSE chooses how to fulfill before DAM

Self-Arrange



And/Or

ERCOT Procurement



Final AS Obligations are posted with DAM results

QSE pays their Final AS Obligation in Day-Ahead Settlement

- Reduced by Self-Arranged Quantity
- Charged at Day-Ahead AS Price

$$\text{DA AS AMT} = (\text{Final Obligation} - \text{Self-Arranged}) * \text{Day-Ahead AS Price}$$

Final AS Obligations are updated in Real-Time Settlement

- New Obligation = Actual Load Ratio Share
- Reconciled to Day-Ahead AS Charge

$$\text{RT AS AMT} = (\text{New Obligation} - \text{Self-Arranged}) * \text{Day-Ahead AS Price} - \text{DA AS AMT}$$



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Self-Arranges 10 MW of Responsive Reserve for Hour 1200

- 16 MW Final Obligation for Responsive Reserve
- \$12 Day-Ahead Responsive Reserve Price
- 15 MW New Obligation for Responsive Reserve





$$DAAS_{AMT} = \left(\frac{DAAS_{AMT}}{DAAS_{AMT}} \right)^* =$$

$$RT_{AS\ AMT} = \left(\frac{RT_{AS\ AMT}}{RT_{AS\ AMT}} \right)^* - =$$

Costs

Energy

Congestion

Ancillary Services

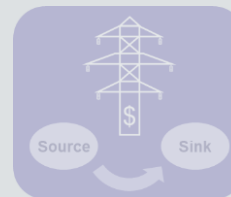
Tools



Day-Ahead Market



Bilateral Trades



CRRs

Financial Ancillary Service Transaction

- Provides AS Price Hedging
 - Paid Day-Ahead AS Price
 - Charged Real-Time AS Price
- Any QSE can participate

Type of Service	Offer	
Regulation Up	MW	\$ / MW
Regulation Down	MW	\$ / MW
Responsive Reserve	MW	\$ / MW
Contingency Reserve	MW	\$ / MW
Non-Spinning Reserve	MW	\$ / MW



Net AS Obligation Costs
Charged Day-Ahead AS Price

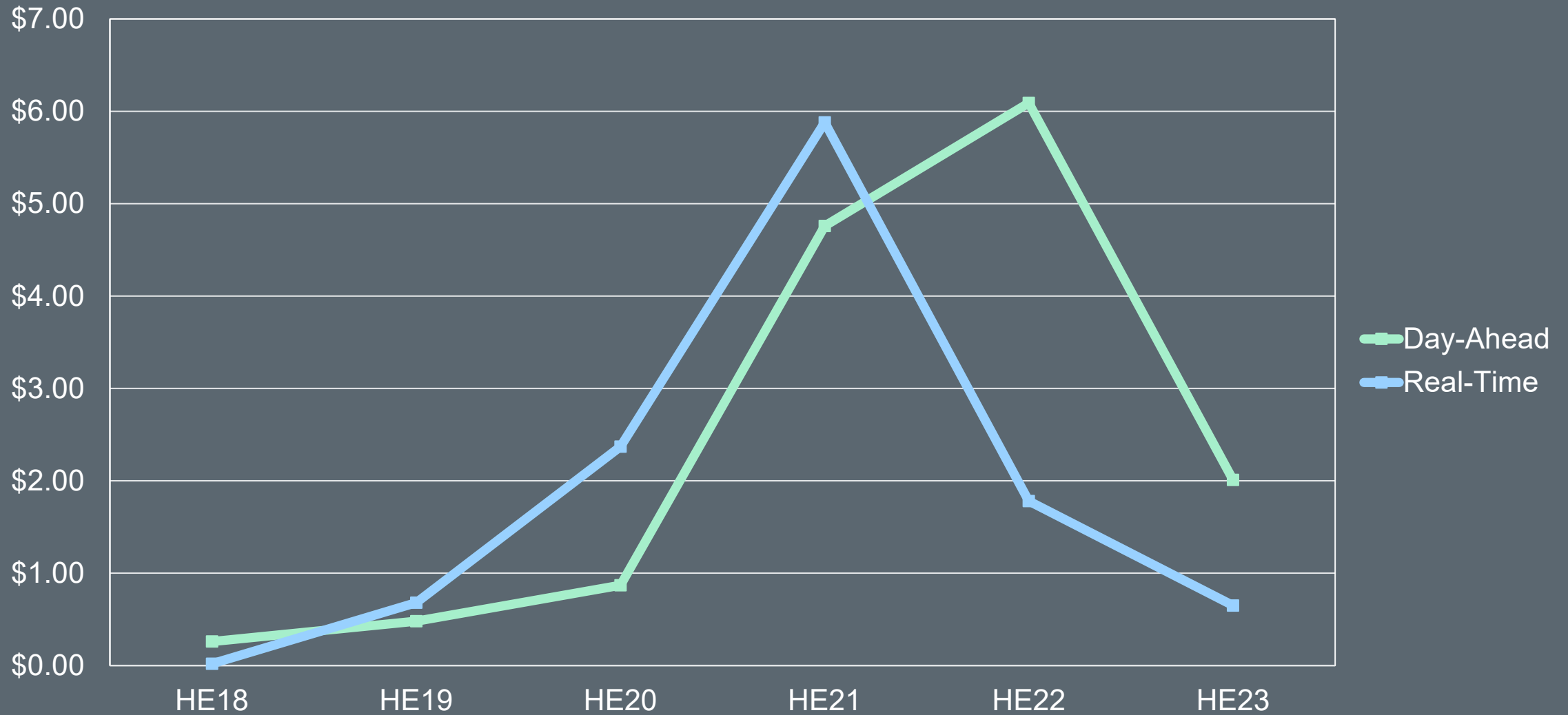


Paid Day-Ahead AS Price
Charged Real-Time AS Price





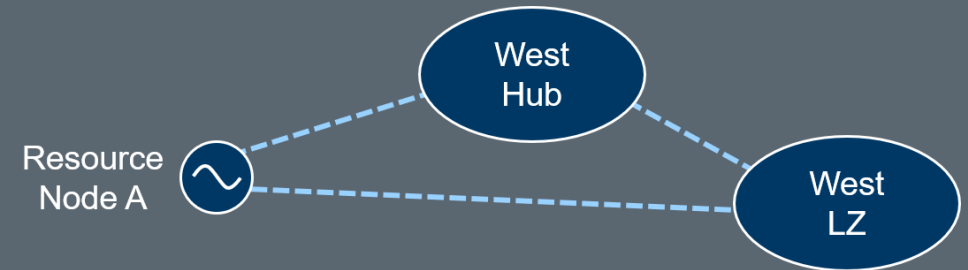
May AS Average (by hour)





Devise a “best” strategy (on your own):

- Link to Workbook: [Load Serving Entities 201](#)
- Start with the “Example Prices” tab
- Minimize cost to serve 100 MW forecast
 - Study Prices
 - Choose Financial Instruments
- Check strategy using the “Divergent Prices” tab
 - Study Updated Prices
 - Adjust Financial Instruments?



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