

Electricity Market

August'18

In this presentation



Introduction to Indian Power Market



Product Portfolio



Trading Mechanism



Market snapshot

Participation

Volume

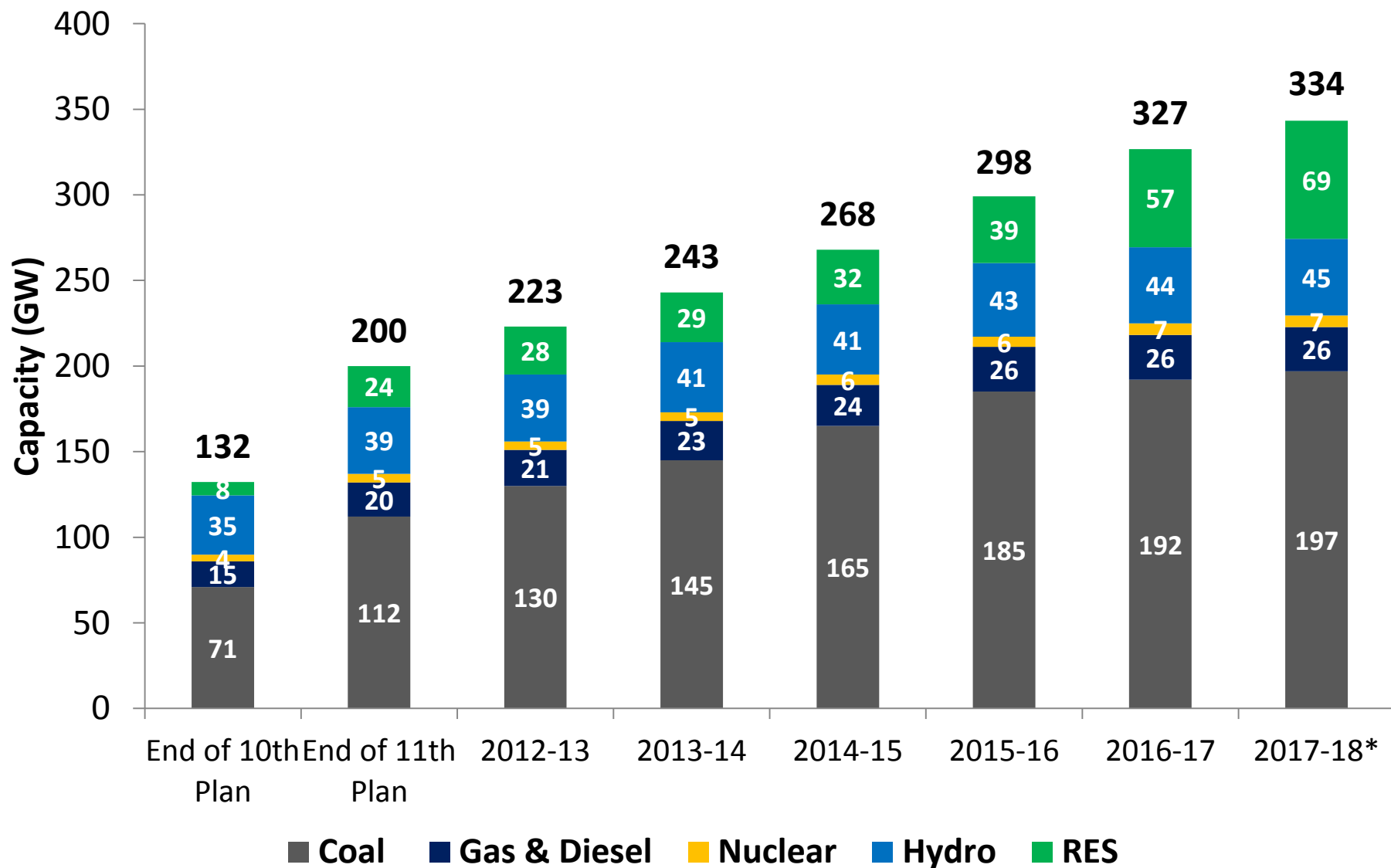
Price



Trade @ IEX



Installed Generation Capacity of India



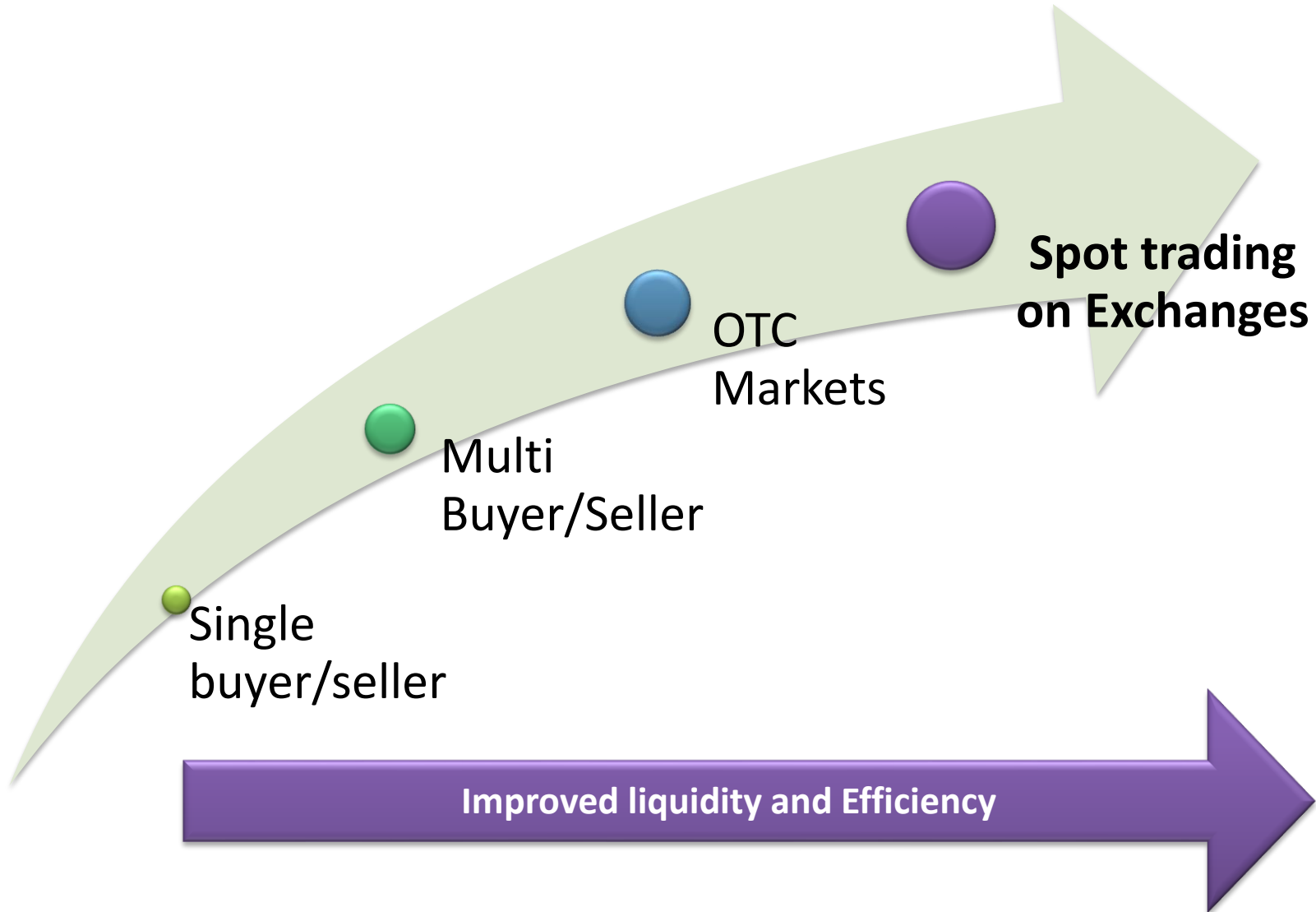
Power Situation in the Country

Year	Installed Capacity (at the end of FY) (MW)	Peak Met (MW)	Energy Available (Excluding RE Gen.) (MU)
2011-12	1,99,877	116,191	857,886
2012-13	2,23,344	123,294	911,209
2013-14	2,43,029	129,815	959,829
2014-15	2,67,367	141,160	1,030,785
2015-16	2,98,060	1,48,463	1,090,713
2016-17	3,26,848	1,56,934	1,135,332
2017-18	3,34,146	1,60,752	9,07,919

- During the last 5 years, **capacity has increased at a CAGR of 10 %** i.e. from 199 GW to 327 GW, **peak demand met increased at a CAGR of only 6.2%** and **energy supply has grown at 5.8% CAGR**

Installed capacity has grown at a faster pace compared to demand

Indian Power Market Development trend



Indian Power Market: Present Status

Long Term
Upto 25 Years

Power Purchase Agreements

89%

Medium Term
3 months- 3years

OTC
Licensed traders (61)

6%

Short-Term
Intraday - 3 months

OTC Intraday- 3 months

Exchanges

1. Intra-day
2. DAM
3. DAC
4. Daily
5. Weekly

3%

Balancing Market
Real Time

Unscheduled Interchange

2%

IEX Market Segments

Day-Ahead Market since June,08	<ul style="list-style-type: none"> • <i>Delivery <u>for next day</u></i> • <i>Price discovery: Closed , Double-sided Auction</i> 	
Intraday Market & Day-Ahead Contingency Round the clock since Jul'15	<ul style="list-style-type: none"> • <i>Intraday: For Delivery <u>within the same day</u></i> • <i>Day Ahead Contingency: <u>Another window for next day</u></i> • <i>Gate closure : 3 hours</i> 	 
Term-Ahead Contracts since Sep,09	<ul style="list-style-type: none"> • <i>For delivery <u>up to 11 days</u></i> • <i>Daily Contracts, Weekly Contracts</i> 	 
Renewable Energy Certificates since Feb,11	<ul style="list-style-type: none"> • Green Attributes as Certificates • Sellers : RE generators not under feed in tariffs • Buyers: Obligated entities; 1MWh equivalent to 1 REC 	
Energy Saving Certificates since 27 Sep'17	<ul style="list-style-type: none"> • <i>1 Ecert= 1 Mtoe(Metric Tonne Oil Equivalent)</i> • <i>Trading Session on every Tuesday of the Week</i> • <i>Trading time 1300 hrs to 1500 hrs</i> 	

Company Snapshot

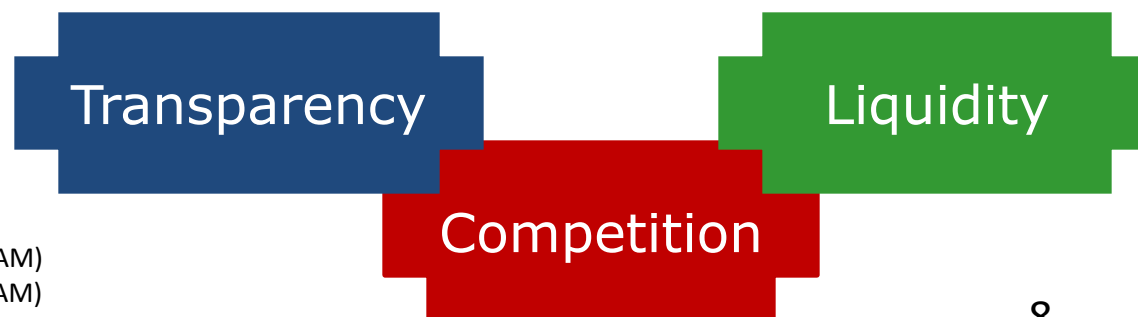


97% Market Share + **5000 MW** average daily trade

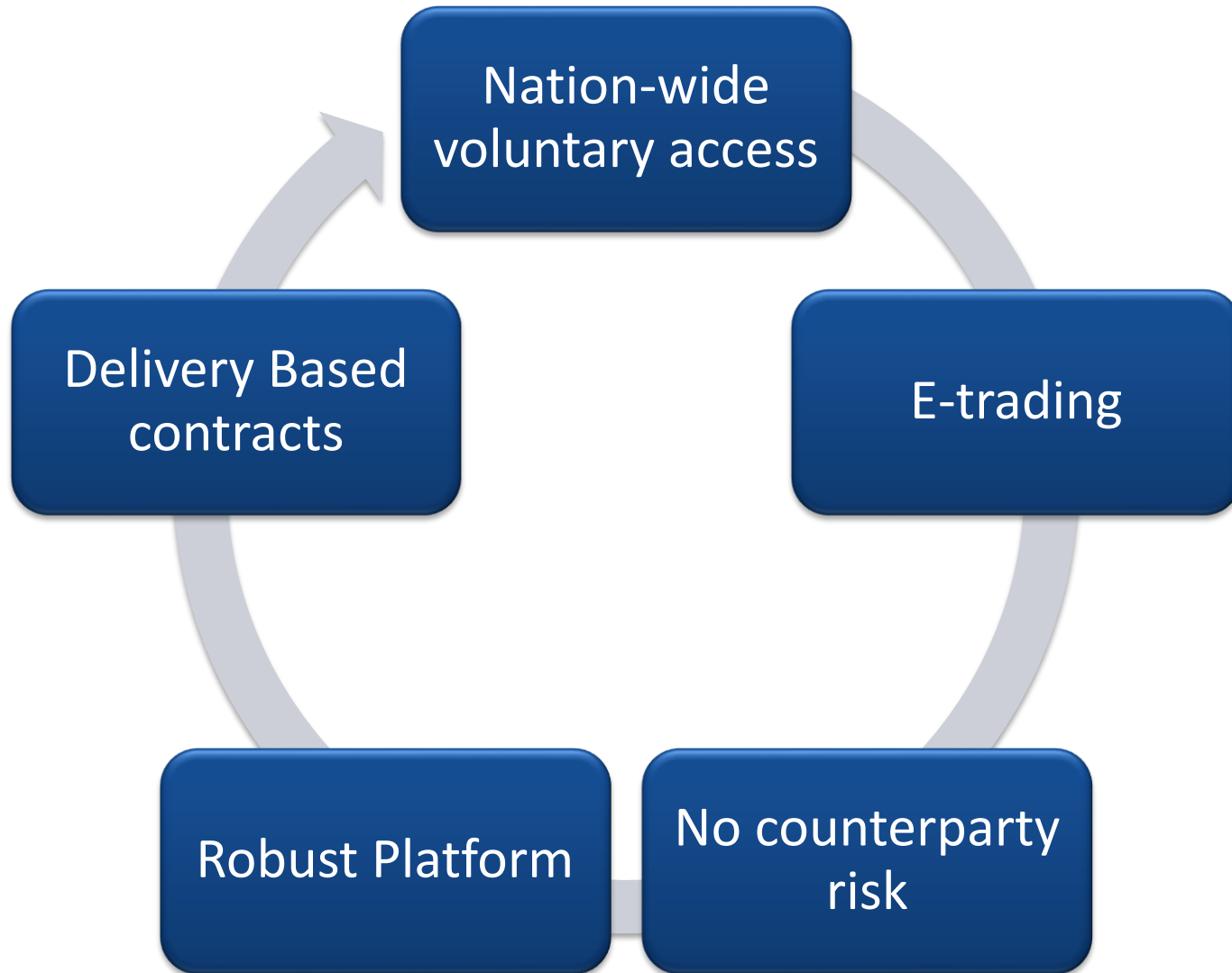
6300+ Participants

4000+ Industries **70+** Commercial **50+** Discoms

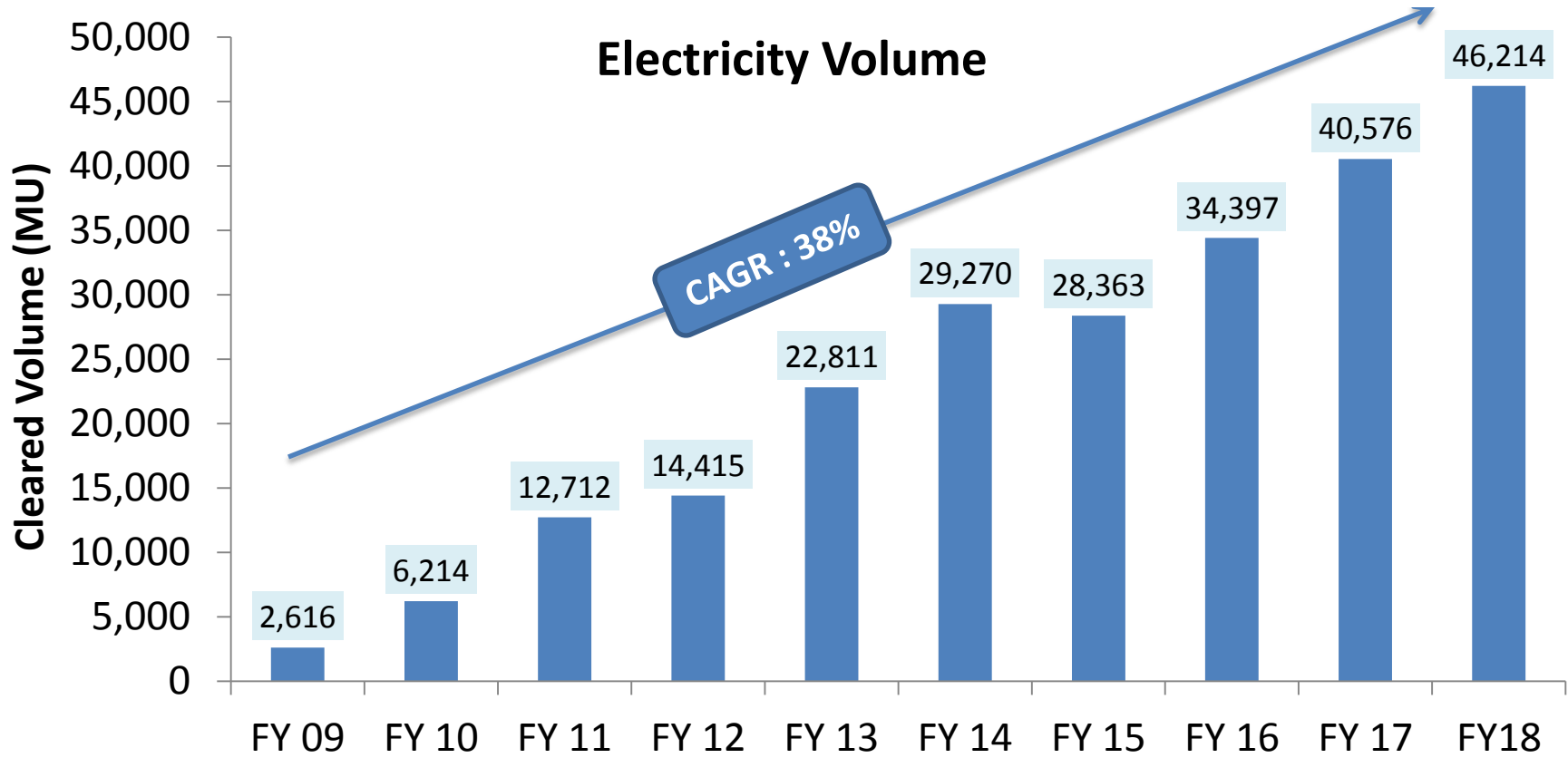
480+ Conventional Generators **1500+** RE Participants

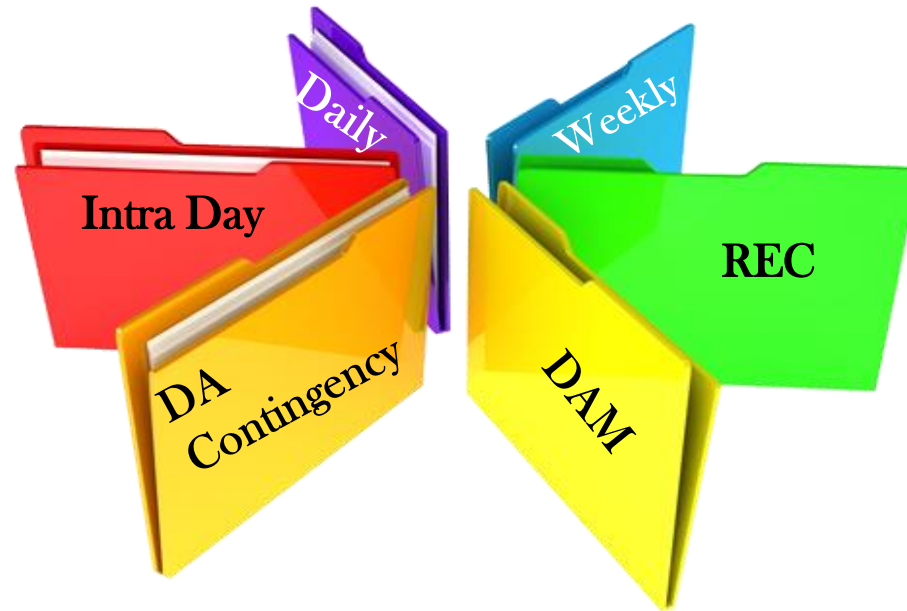


What benefits does the power exchange provide?



IEX Volume Growth : Strong trend line





Product Portfolio

Product Segments

Day Ahead Market (DAM)

Trade for the following day

Contracts for every 15 min, closed auction

Term Ahead Market (TAM)

From 3 Hrs ahead to 11 days in advance

4 types of contracts

- **Intraday**
- **Day Ahead Contingency**
- **Daily**
- **Weekly**

Renewable Energy Certificates (RECs)

Trade green attributes of electricity

1 REC = 1 MWh of green energy

Contract Characteristics

TERM AHEAD MARKET

Contract Characteristic
Delivery
Auction Type
Contracts
Trade Availability
Financial Settlement

Day Ahead Market
Next day
Closed Auction
15 min
All Days
Pay-In- D-1; Pay Out – D+1

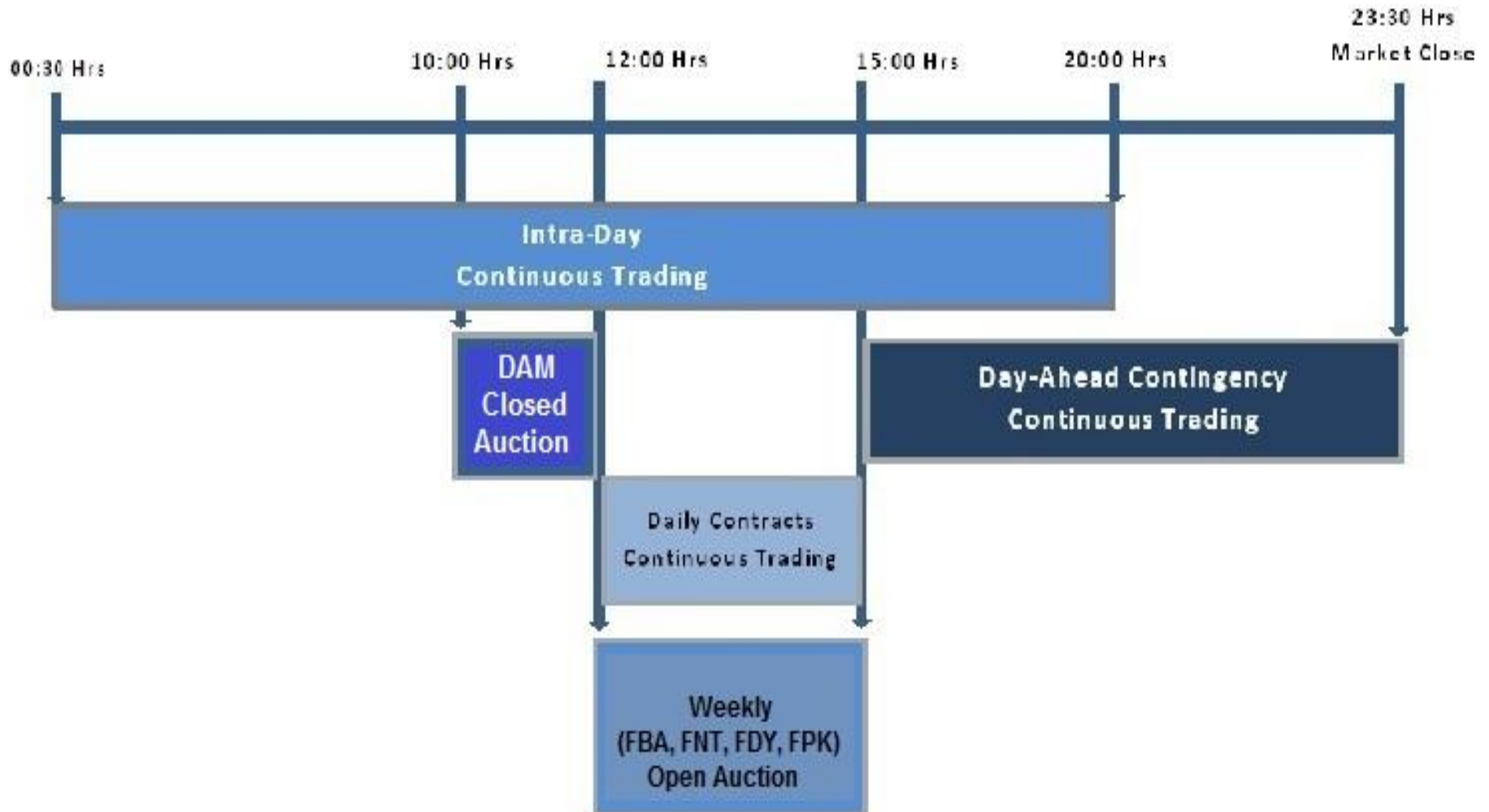
Intraday Contracts
0400-2400 Hrs same day
Continuous trading
Hourly
All days
Pay in: T+1 Pay out: T+1

Day Ahead Contingency
For next day
Continuous trading
Hourly
All Days; 1500-2300
Pay in: T+1 Pay out: T+2

Daily Contracts
From 4 th day to next 7 days
Continuous trading
Block of Hours (Fixed)
All Days; 1200-1500
Pay-In- D-1; Pay Out – D+1

Weekly Contracts
For next week
Open Auction
Block of Hours (Fixed)
Wed & Thurs; 1200-1600
Pay-In- D-1; Pay Out – D+1

DAM and TAM Trading Timeline





Trading Mechanism

Features of Day Ahead Market

A closed double-sided anonymous auction for **each 15-min time block** for the following day

The intersection between the aggregated sale and purchase curves defines the market clearing price (MCP)

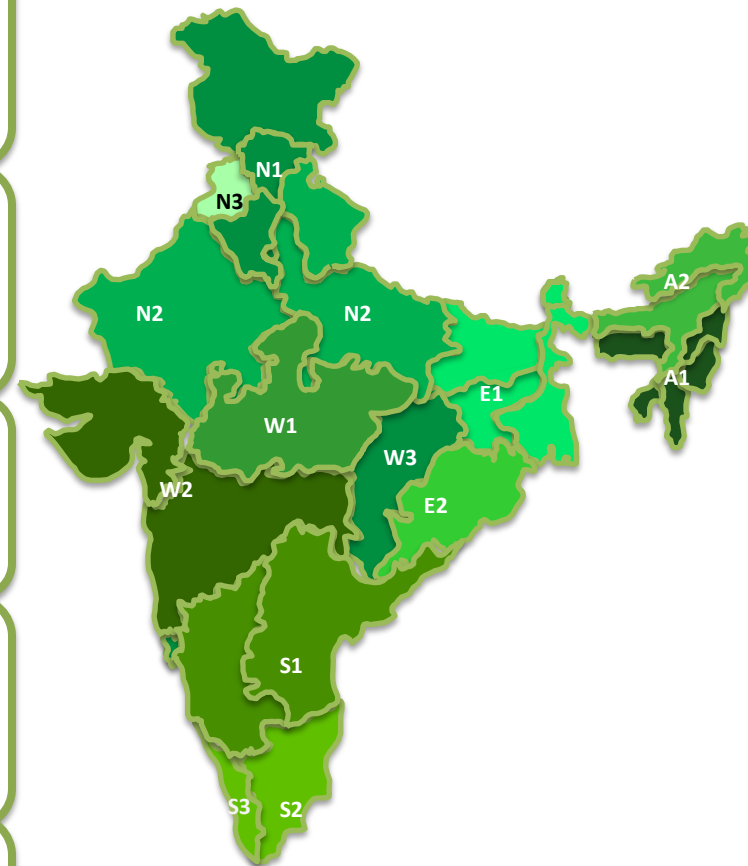
13 Bid area defined

Congestion Management through market splitting and determining Area Clearing Price (ACP) specific to an area

Bid types: Portfolio Orders or Block Orders

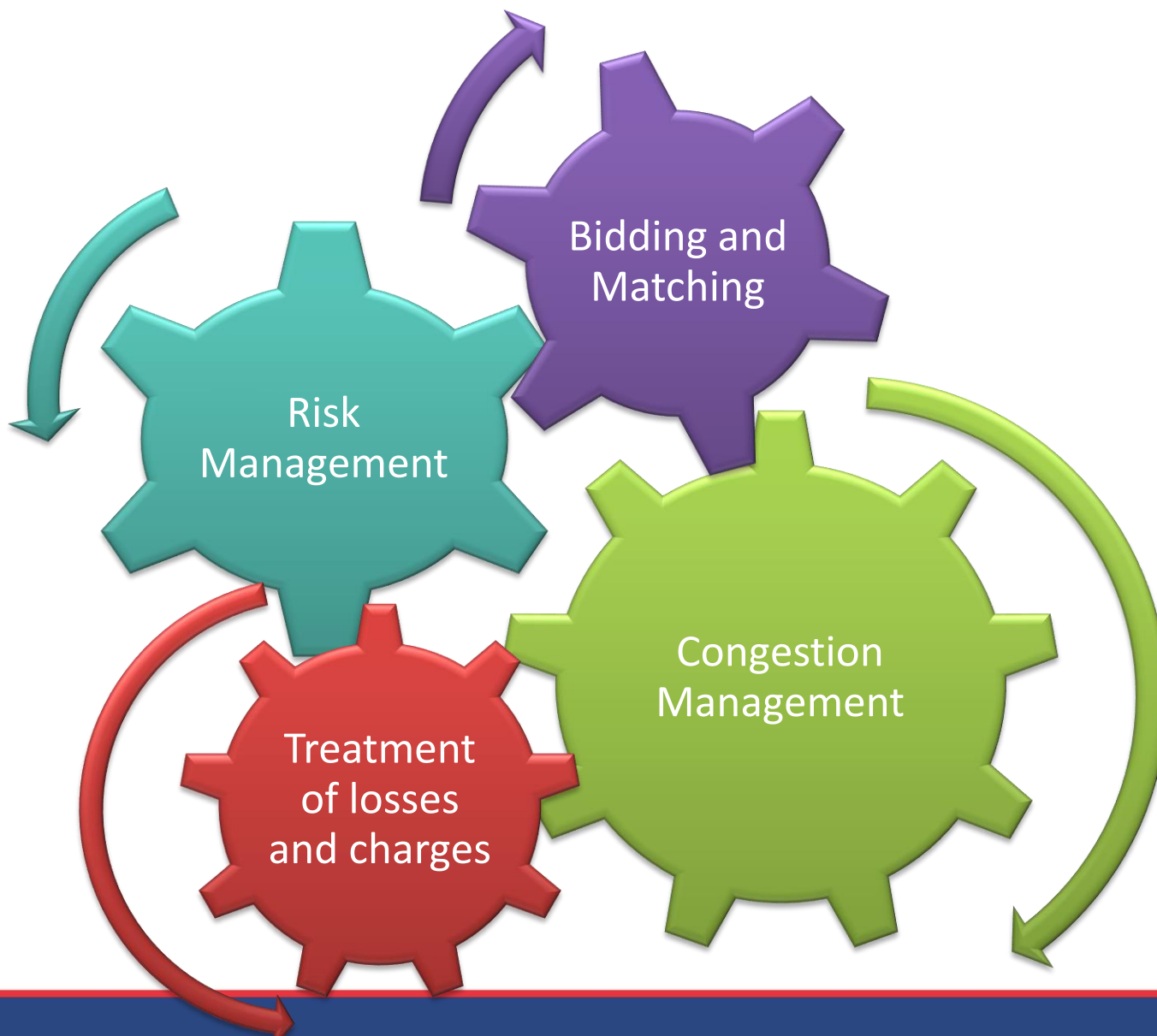
Minimum bid=Re.1 for 0.1MWh

Minimum Price & Volume Step = 0.1p * 0.1 MWh

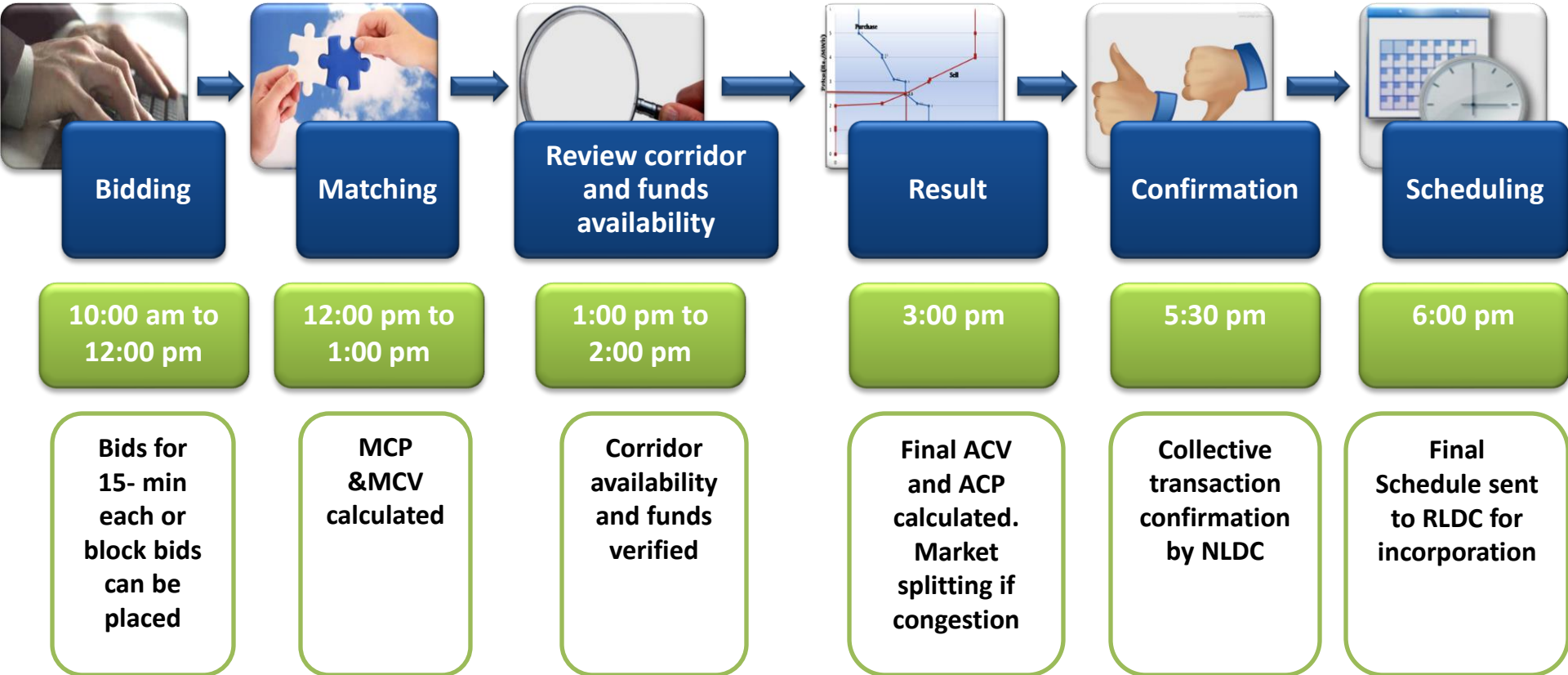


13 Bid Areas

Understanding exchange mechanism



DAM trading process



DAM-Single Bid

File Control DAM View Tools Window Help

IEX INDIAN ENERGY EXCHANGE India's No. 1 Power Exchange 18:41:14

Single BID

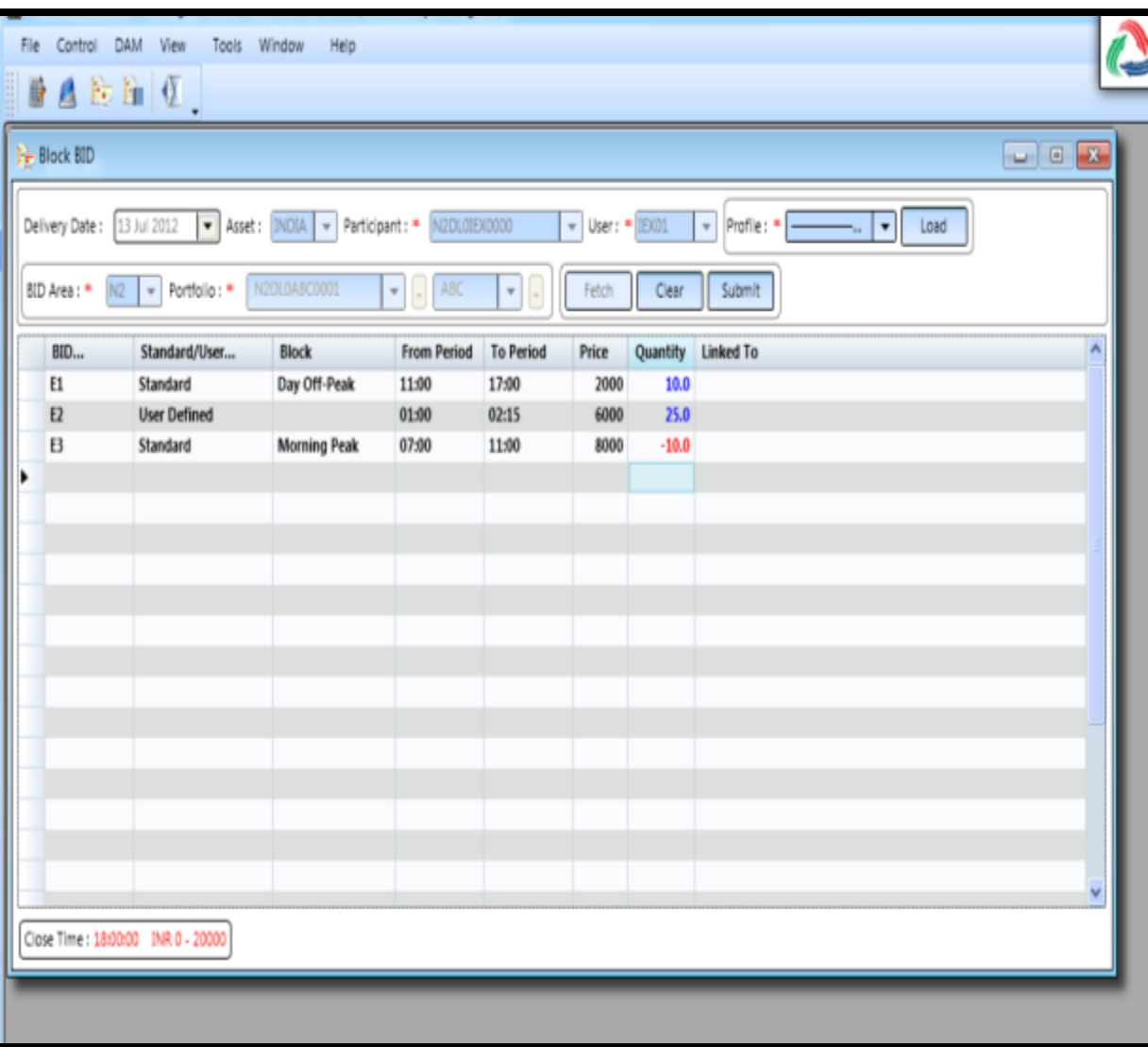
Delivery Date: 13 Jul 2012 Asset: INDIA Participant: N2DLOIEX0000 User: IEX01 Auto BID Profile: Load

BID Area: N2 Portfolio: N2DLOABC0001 ABC Fetch Clear Submit

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
00:30 - 00:45	50.0	50.0	0.0							0.0								
00:45 - 01:00	50.0	50.0	0.0							0.0								
01:00 - 01:15																		
01:15 - 01:30	75.0	75.0	75.0	75.0	0.0					0.0								
01:30 - 01:45	75.0	75.0	75.0	75.0	0.0					0.0								
01:45 - 02:00	75.0	75.0	75.0	75.0	0.0					0.0								
02:00 - 02:15	75.0	75.0	75.0	75.0	0.0					0.0								
02:15 - 02:30																		
02:30 - 02:45																		
02:45 - 03:00																		
03:00 - 03:15	0.0						0.0	-25.0		-25.0								
03:15 - 03:30	0.0						0.0	-25.0		-25.0								
03:30 - 03:45	0.0						0.0	-25.0		-25.0								
03:45 - 04:00	0.0						0.0	-25.0		-25.0								
04:00 - 04:15																		
04:15 - 04:30	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
04:30 - 04:45	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
04:45 - 05:00	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
05:00 - 05:15	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
05:15 - 05:30	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
05:30 - 05:45	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
05:45 - 06:00	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
06:00 - 06:15	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
06:15 - 06:30	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
06:30 - 06:45	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
06:45 - 07:00	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
07:00 - 07:15	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
07:15 - 07:30	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
07:30 - 07:45	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
07:45 - 08:00	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	0.0	0.0							
SUM	1400.0	1520.0	1320.0	1320.0	1020.0	1020.0	920.0	900.0	0.0	-100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Close Time: 18:00:00 INR 0 - 2000

DAM-Block Bid



The screenshot shows the 'Block BID' application window. The menu bar includes 'File', 'Control', 'DAM', 'View', 'Tools', 'Window', and 'Help'. The main interface contains several dropdown menus and buttons for filtering and submitting bids. The table below displays the current bid data.

BID...	Standard/User...	Block	From Period	To Period	Price	Quantity	Linked To
E1	Standard	Day Off-Peak	11:00	17:00	2000	10.0	
E2	User Defined		01:00	02:15	6000	25.0	
E3	Standard	Morning Peak	07:00	11:00	8000	-10.0	

At the bottom left of the window, a status bar indicates 'Close Time: 18:00:00 INR 0 - 20300'.

Rules for bid linking :

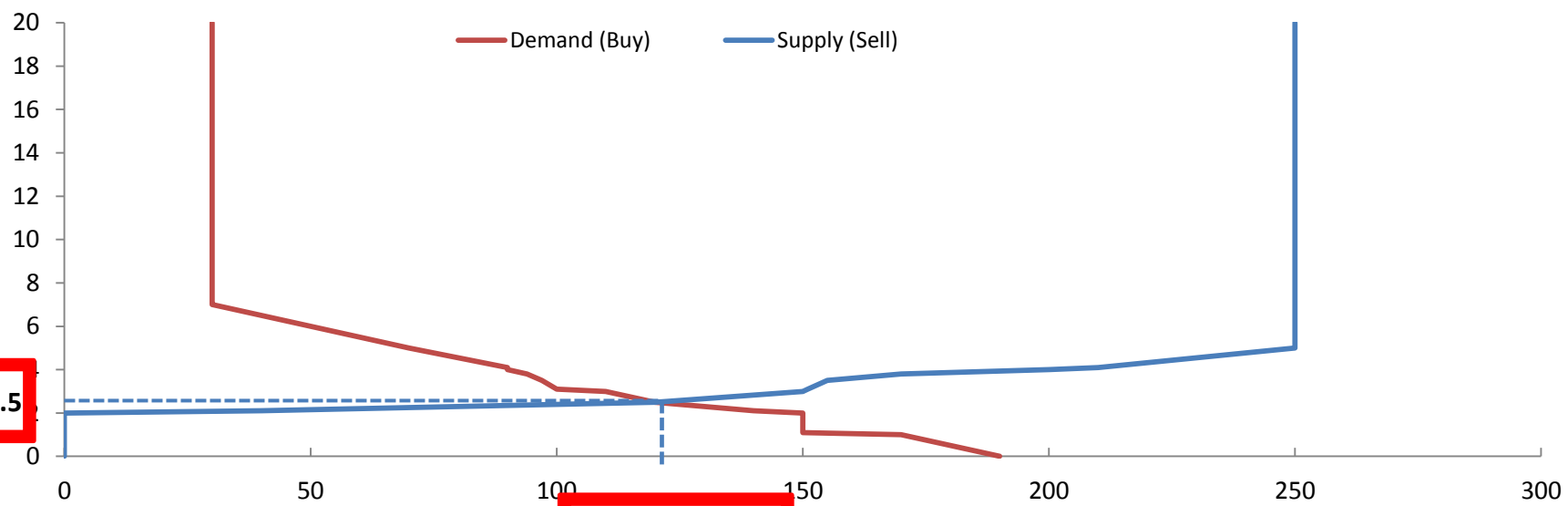
- A bid (bid B) can only be linked to one other bid (bid A)
- Both bid A and bid B must be of same type, i.e. sale-sale or purchase-purchase.
- Bid A and bid B can span any set of hours independently of each other
- Bid A and bid B can have any bid price independently of each other.

Matching: Model Price Calculation algorithm

(Example for a sample 15-min)

Price Tick	0	1	1.1	2	2.1	2.5	3	3.1	3.5	3.8	4	4.1	5	7	9	12	14	17	19	20
Portfolio A	20	20	20	20	20	20	20	10	7	4	0	0	0	0	0	0	0	0	0	0
Portfolio B	60	60	60	60	50	40	40	40	40	40	40	40	20	20	20	20	20	20	20	20
Portfolio C	70	70	70	70	70	60	50	50	50	50	50	50	50	10	10	10	10	10	10	10
Portfolio D	40	20	0	0	-40	-60	-80	-81	-85	-100	-120	-120	-120	-120	-120	-120	-120	-120	-120	-120
Portfolio E	0	0	0	0	0	-40	-50	-50	-50	-50	-60	-60	-90	-90	-90	-90	-90	-90	-90	-90
Portfolio F	0	0	0	0	0	-20	-20	-20	-20	-20	-20	-30	-40	-40	-40	-40	-40	-40	-40	-40

Total Buy, MW	190	170	150	150	140	120	110	100	97	94	90	90	70	30	30	30	30	30	30	30
Total Sell, MW	0	0	0	0	-40	-120	150	-151	-155	-170	-200	-210	-250	-250	-250	-250	-250	-250	-250	-250
Net Transaction, MW	190	170	150	150	100	0	-40	-51	-58	-76	-110	-120	-180	-220	-220	-220	-220	-220	-220	-220



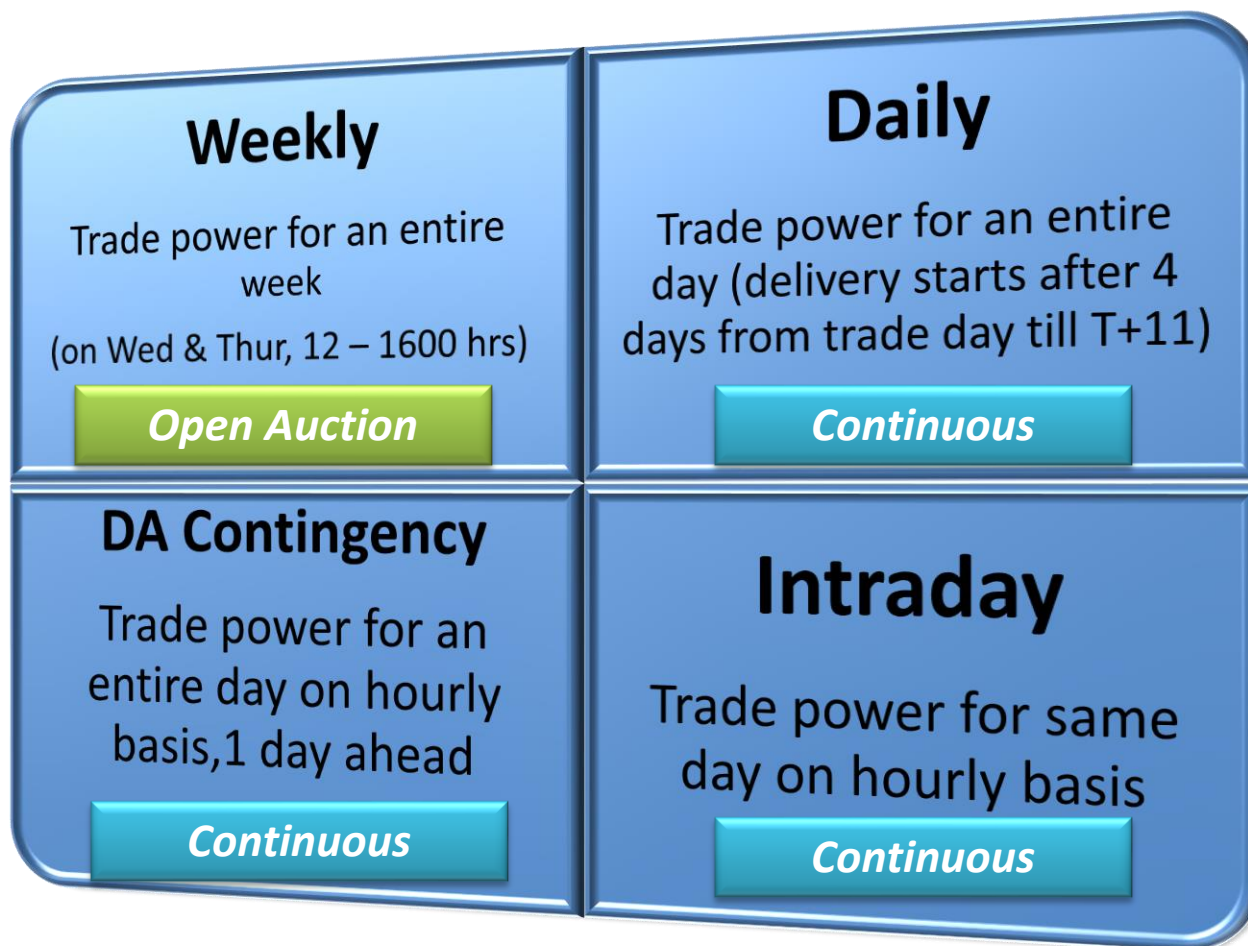
MCP: Rs 2.5

MCV: 120 MW



Term Ahead Market

TAM Market Segments



Types of Contracts

- Weekly and Daily
 - FBA -- Firm Base – 24 Hrs
 - FNT -- Firm Night – 8 Hrs (0-7 & 23-24)
 - FDY -- Firm Day – 11Hrs (7-18)
 - FPK -- Firm Peak – 5 Hrs (18-23)
- Day Ahead Contingency and Intra-Day
 - Hourly (DAC-24 hrs & Intraday-04-24)

Region Specific Contracts

Intra-day & DAC contracts with current trading system

Trading Date	Trading Time	Intra-Day contracts	DAC contracts
17-04-2016	00:30- 01	H5 to 24 (of 17-04)	
17-04-2016	01 - 02	H6 to 24 (of 17-04)	
17-04-2016	02 - 03	H7 to 24 (of 17-04)	
17-04-2016	03 - 04	H8 to 24 (of 17-04)	
17-04-2016	04 - 05	H9 to 24 (of 17-04)	
17-04-2016	05 - 06	H10 to 24 (of 17-04)	
17-04-2016	06 - 07	H11 to 24 (of 17-04)	
17-04-2016	07 - 08	H12 to 24 (of 17-04)	
17-04-2016	08 - 09	H13 to 24 (of 17-04)	
17-04-2016	09 - 10	H14 to 24 (of 17-04)	
17-04-2016	10 - 11	H15 to 24 (of 17-04)	
17-04-2016	11 - 12	H16 to 24 (of 17-04)	
17-04-2016	12 - 13	H17 to 24 (of 17-04)	
17-04-2016	13 - 14	H18 to 24 (of 17-04)	
17-04-2016	14 - 15	H19 to 24 (of 17-04)	
17-04-2016	15 - 16	H20 to 24 (of 17-04)	H1 to 24 (of 18-04)
17-04-2016	16 - 17	H21 to 24 (of 17-04)	H1 to 24 (of 18-04)
17-04-2016	17 - 18	H22 to 24 (of 17-04)	H1 to 24 (of 18-04)
17-04-2016	18 - 19	H23 to 24 (of 17-04)	H1 to 24 (of 18-04)
17-04-2016	19 - 20	H24 to 24 (of 17-04)	H1 to 24 (of 18-04)
17-04-2016	20 - 21		H1 to 24 (of 18-04)
17-04-2016	21 - 22		H2 to 24 (of 18-04)
17-04-2016	22 - 23		H3 to 24 (of 18-04)

Market Place Functionality (TAM)





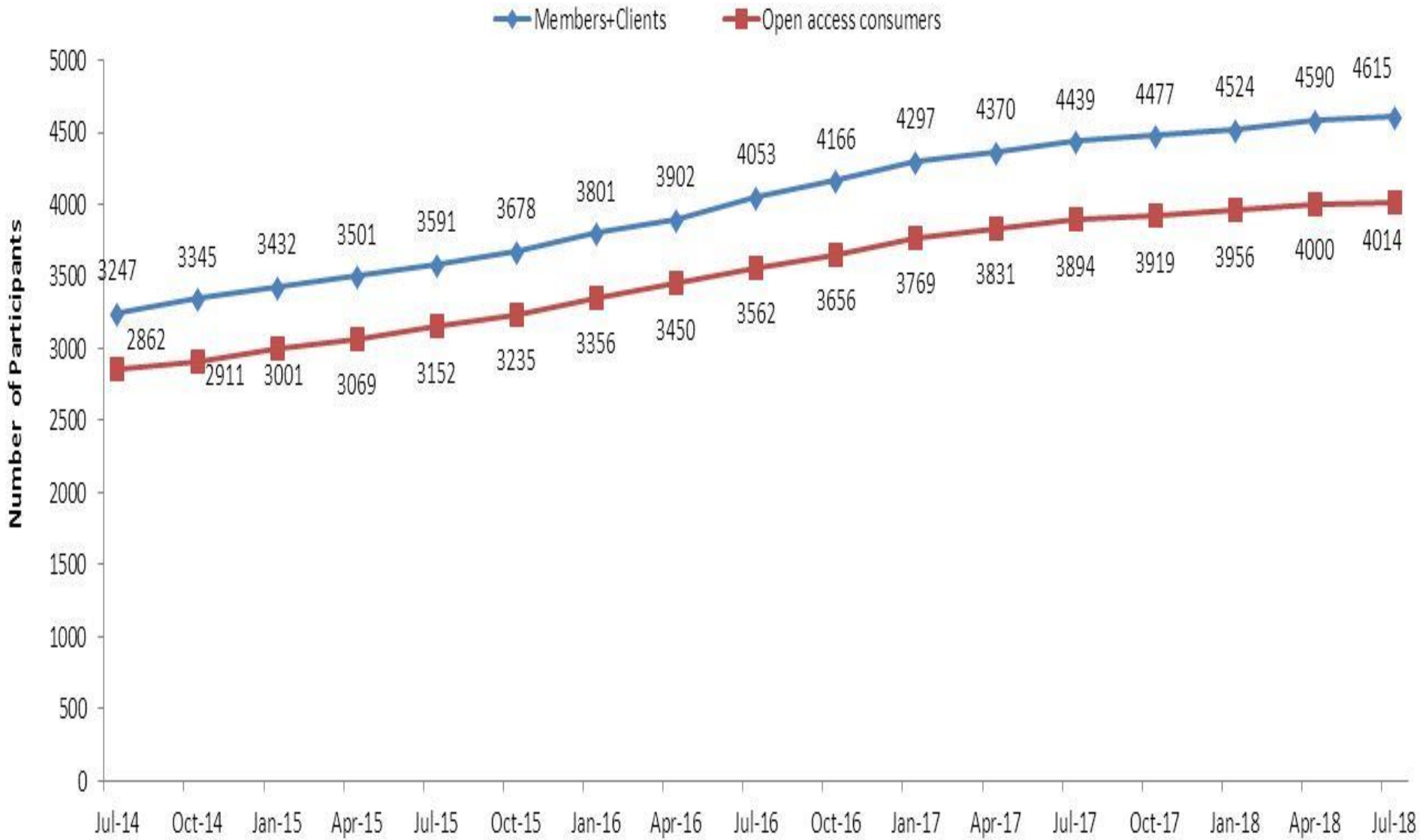
Market Snapshot

Participation

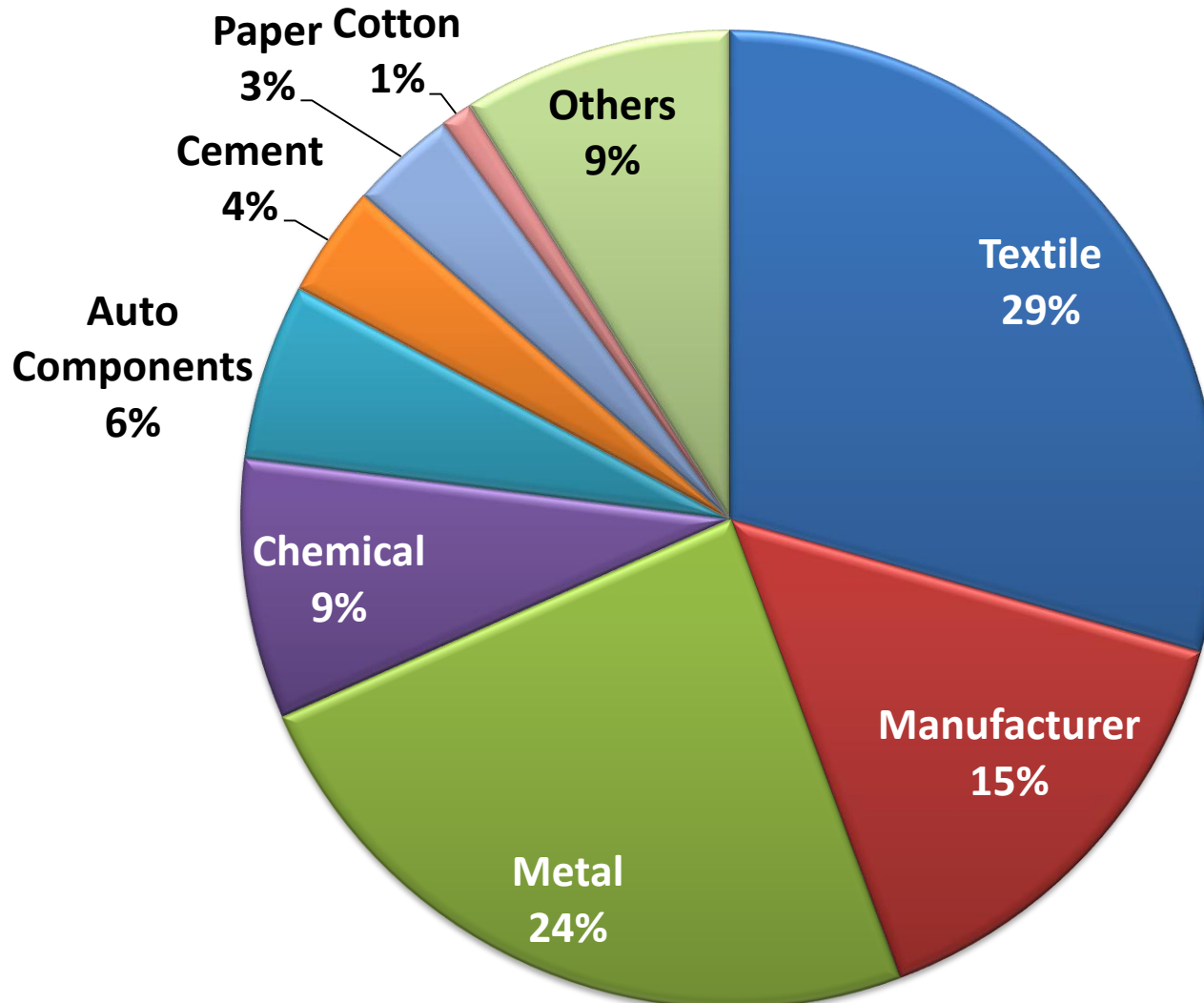
Volume

Prices

Increasing Participation

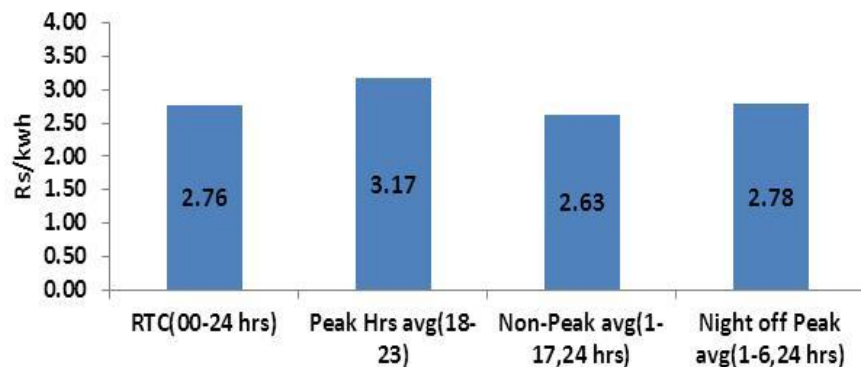


Industrial segments with IEX

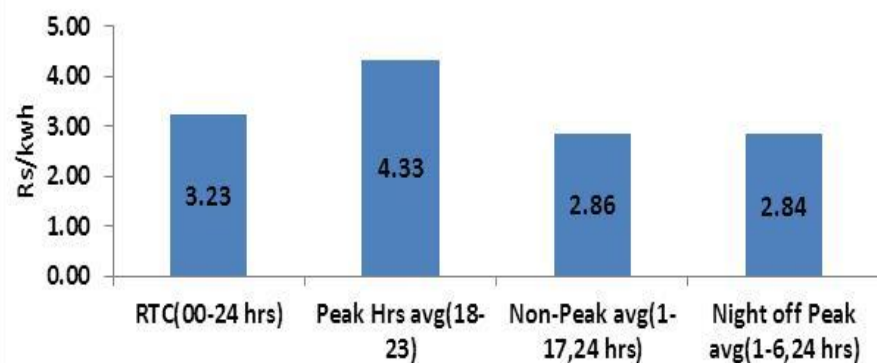


Quarterly Prices FY 2017-18

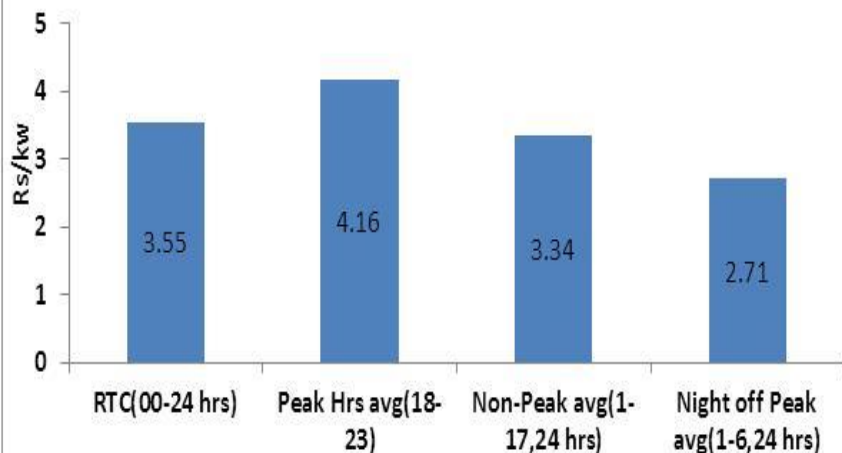
IEX Prices in Quarter 1 (Apr-June'17)



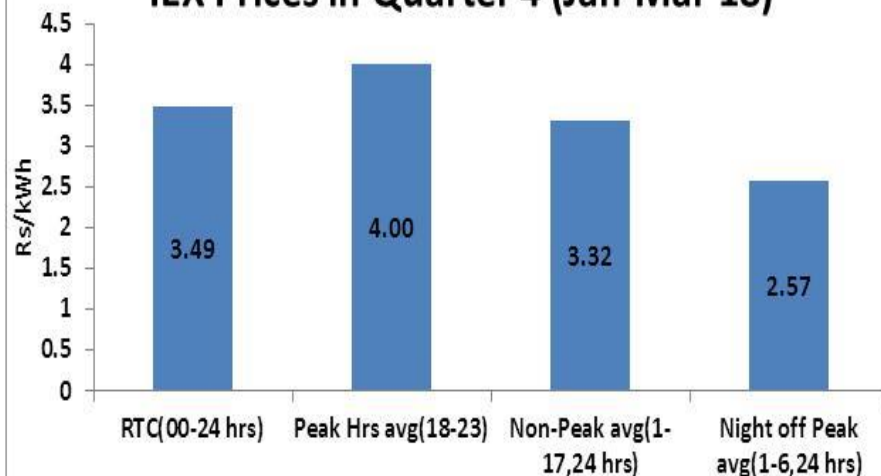
IEX Prices in Quarter 2 (July-Sep'17)



IEX Prices in Quarter 3 (Oct-Dec'17)

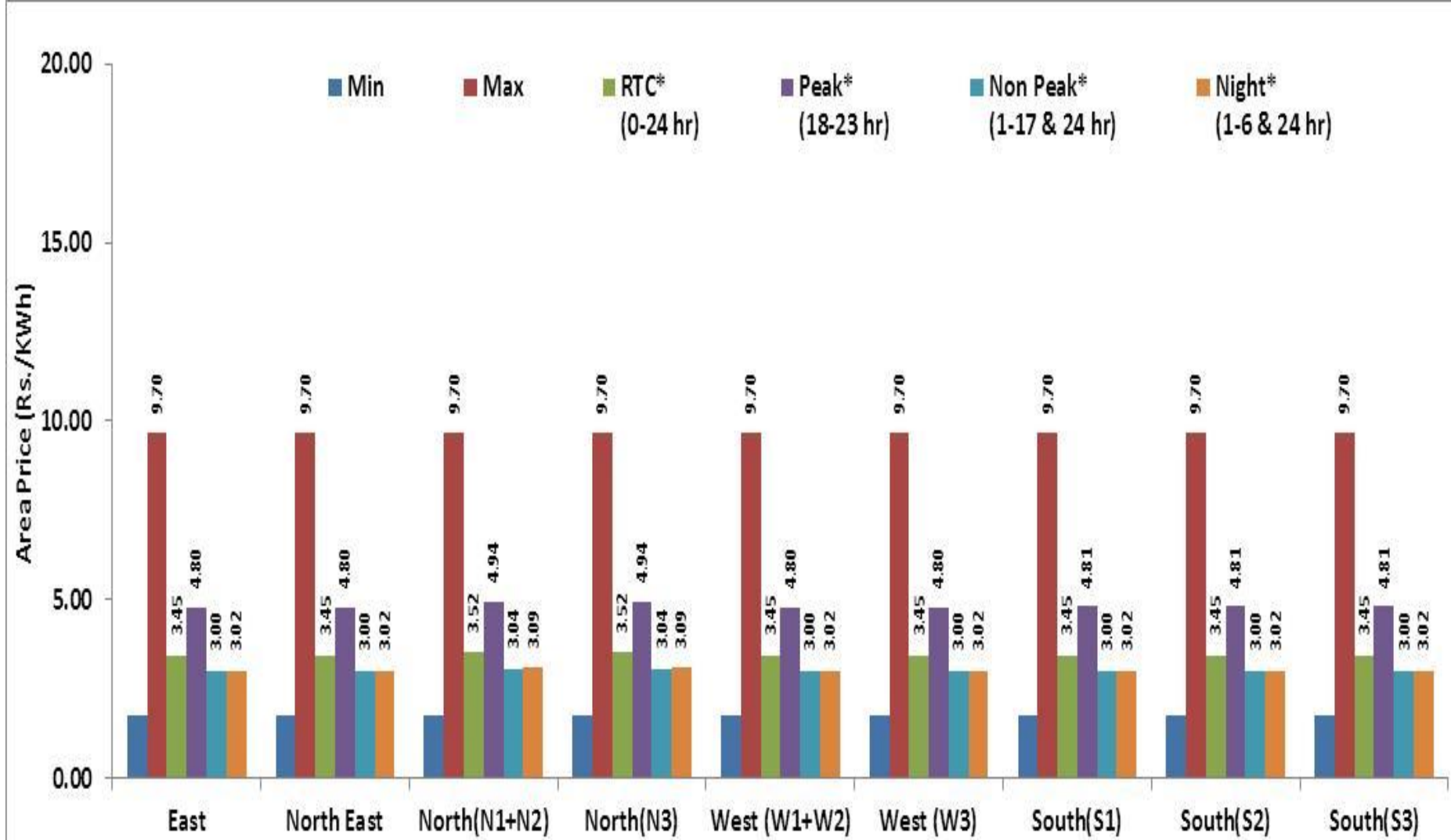


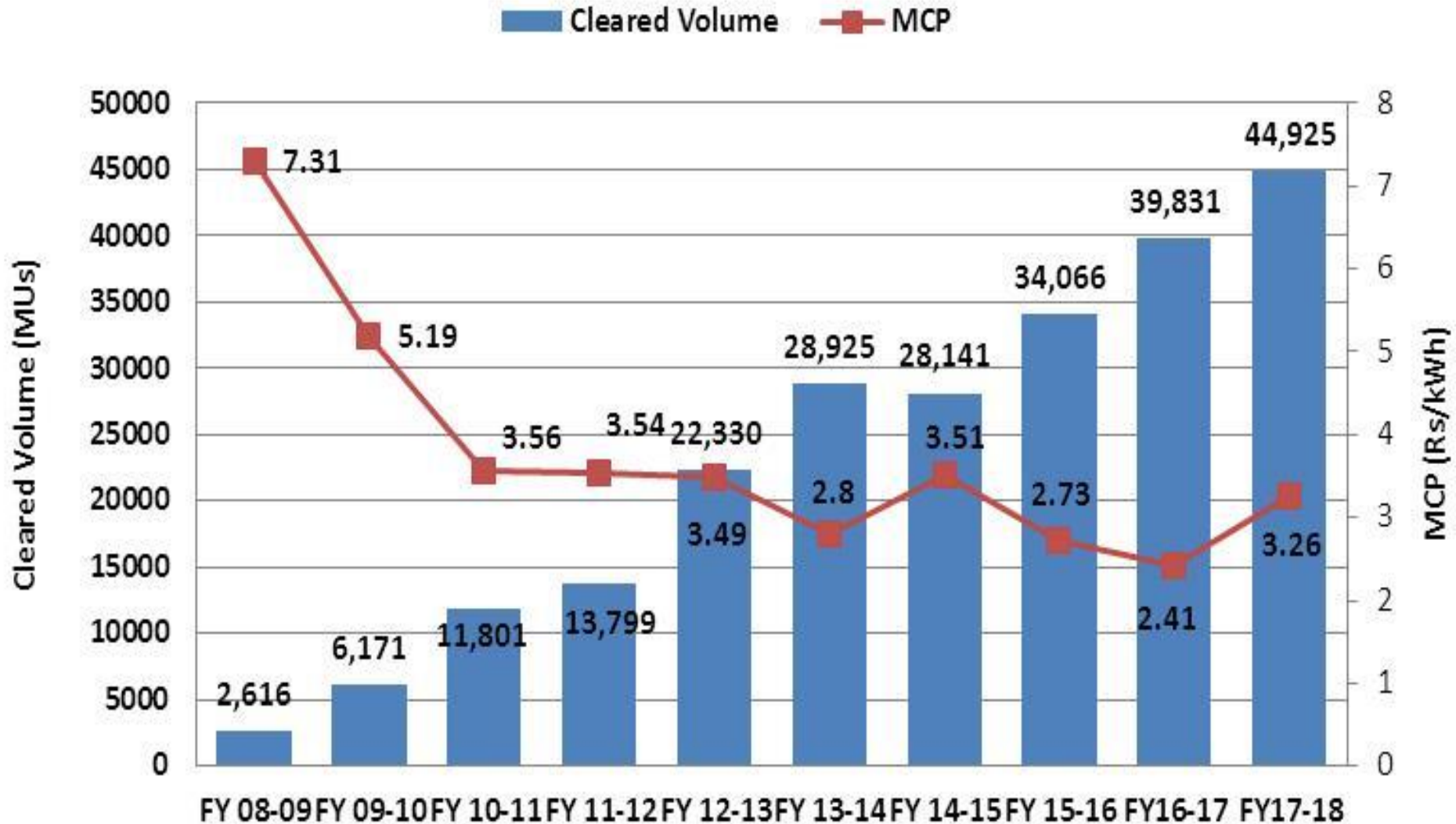
IEX Prices in Quarter 4 (Jan-Mar'18)



Prices for various time block

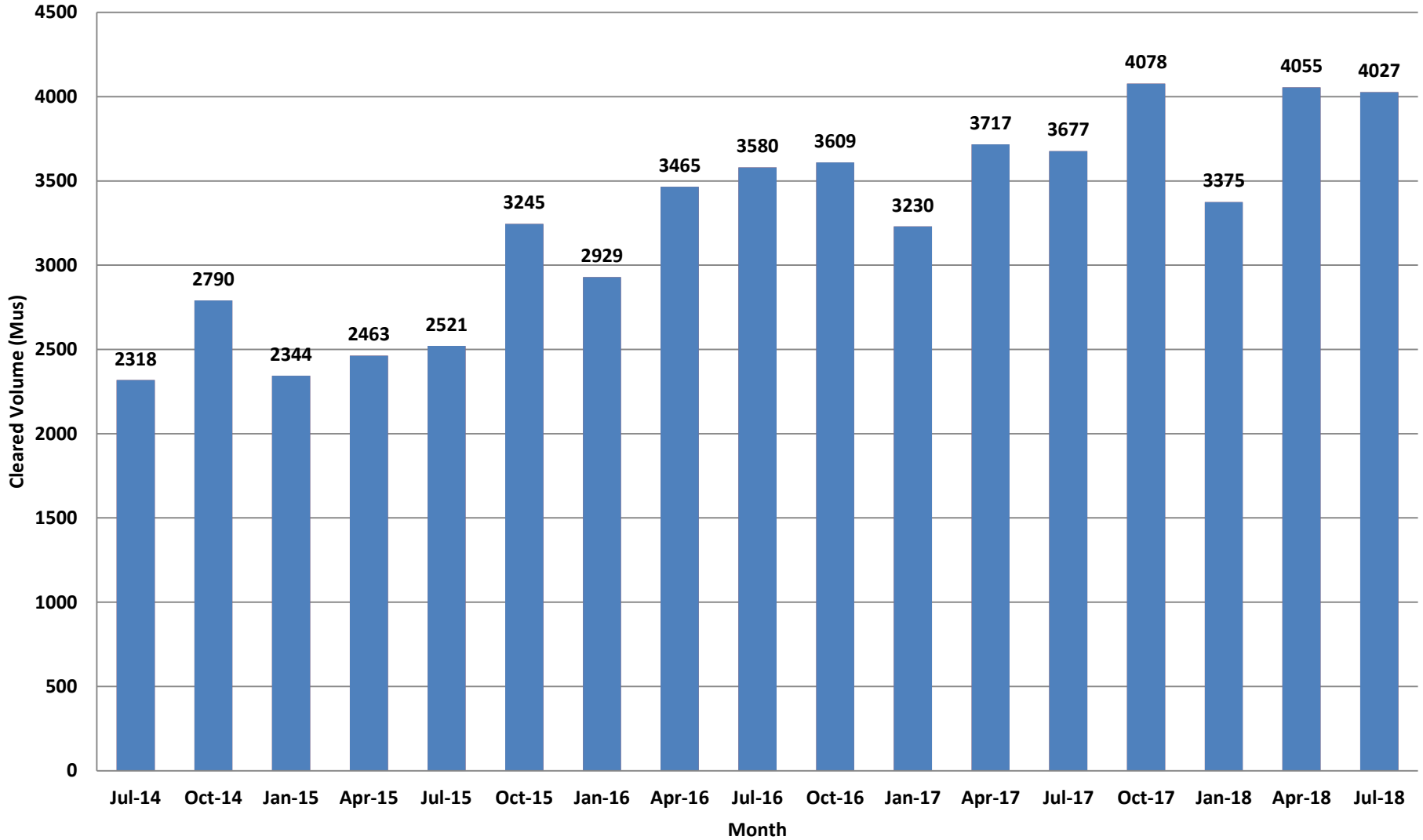
July 2018





IEX Monthly Cleared Volume

■ Total Monthly Volume (MUs) ■ Total Monthly Volume (MUs)



TAM: Performance so far

Weekly

2,946,452 MWh

Day-ahead Contingency

16,71,894 MWh

Total Volume traded
6,793MUs

Intraday

14,27,729 MWh

Daily

7,47,616 MWh

TAM Monthly Snapshot – July'18

Contracts	Total Volume (MWh)	Max Price (Rs./kWh)	Min Price (Rs./kWh)
Weekly	-	-	-
Intraday	51,689	10.00	2.10
Day-Ahead Contingency	68,948	9.20	2.499
Daily	-	-	-

Thank You

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