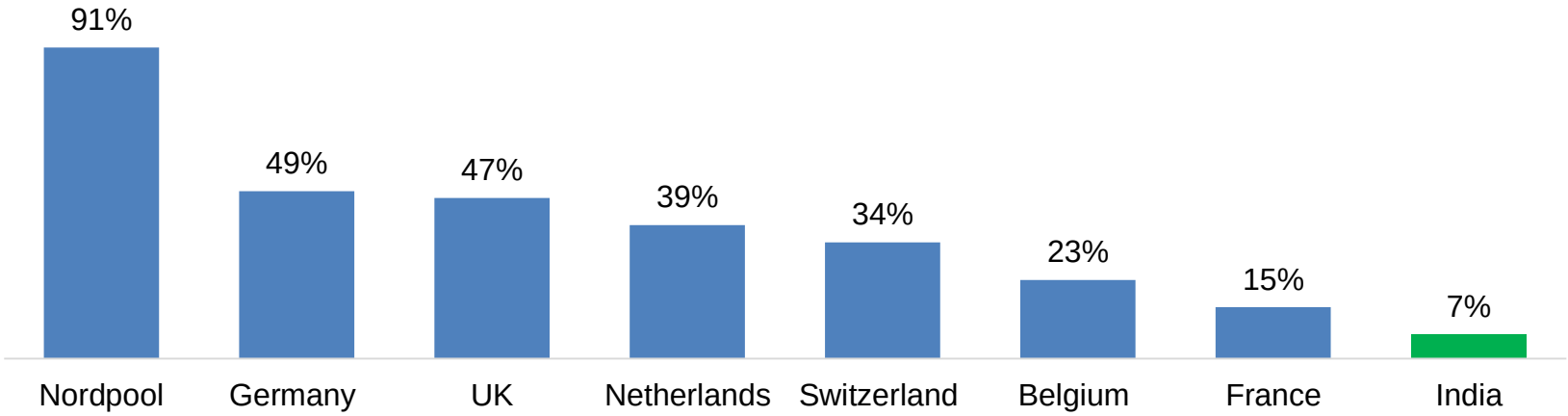
# Functioning of Power Exchange

# Evolution of Power Markets

# Immense Potential to Deepen India's Power Market



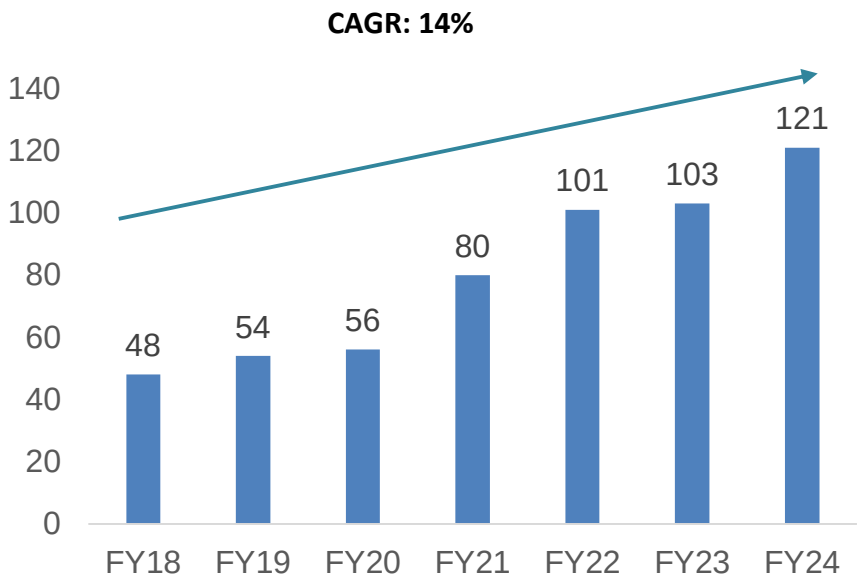

*Note: Data for India till Mar'23*
*Source: CRISIL Study*

**Markets are in the range of 30-80% in developed economies.**

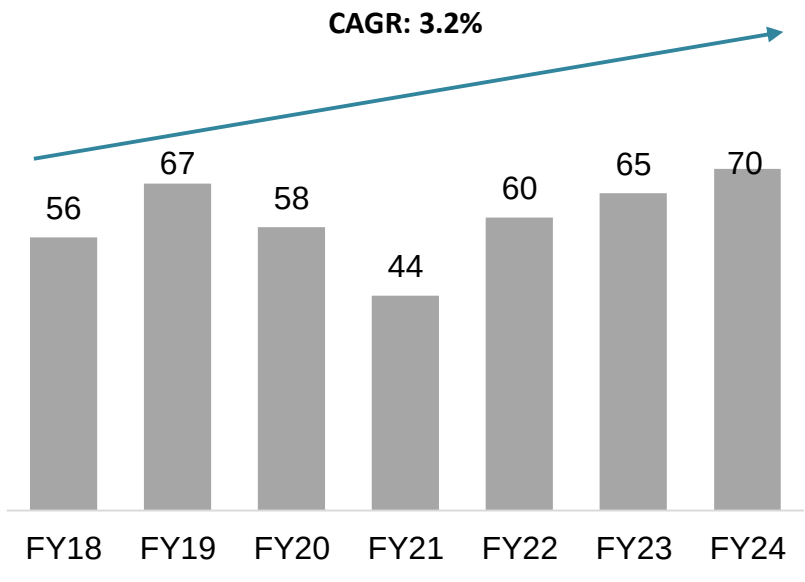
**At 7%, India has an opportunity to deepen the power market.**

# Exchange Markets Growth

## Exchanges (BU)

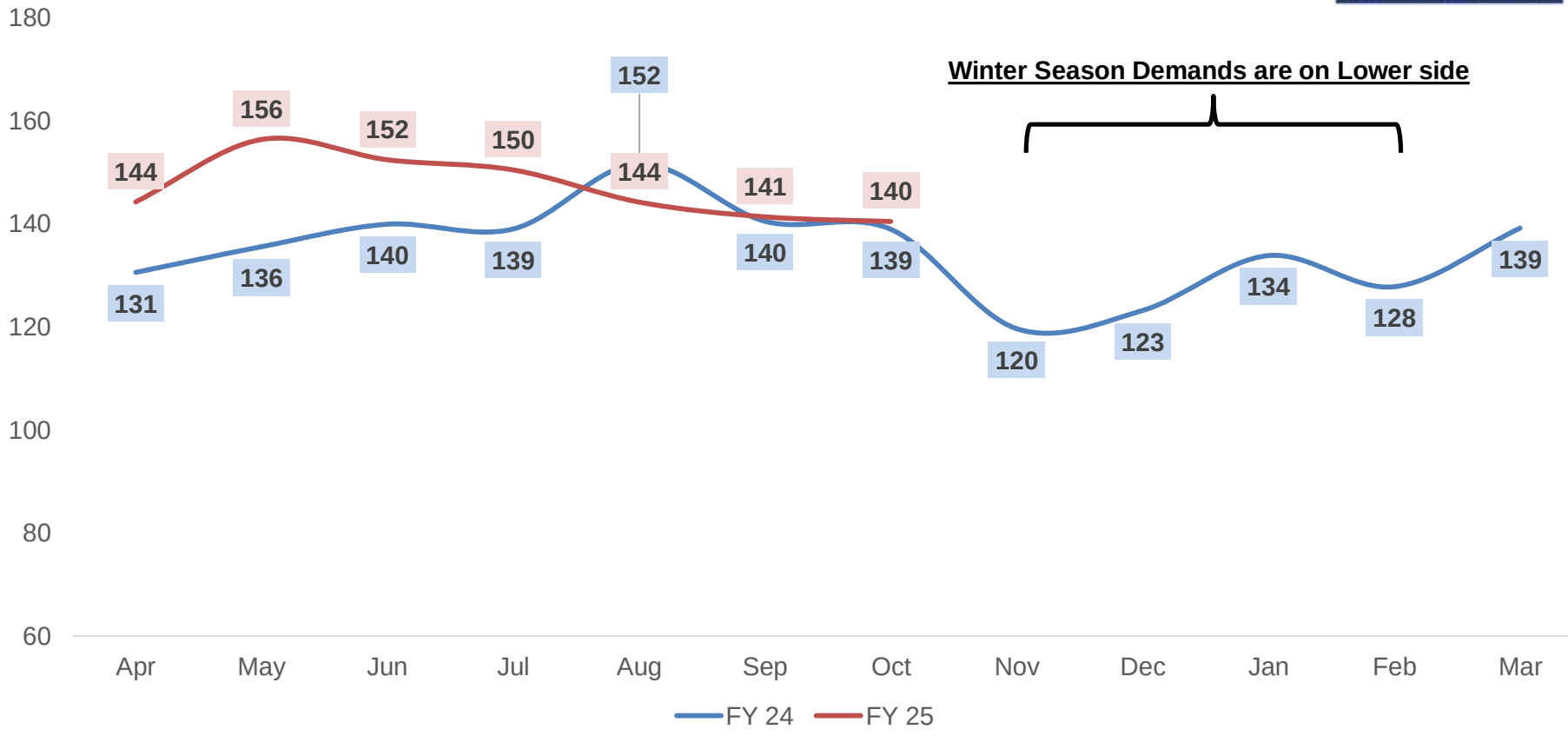



## Bilatéral (BU)




*Source: CERC, MMR Reports*

# Monthly All India Demand Met (BU)



# Overview to IEX

# IEX: India's premier technology-led energy marketplace

- Nation wide, automated and transparent trading platform for physical delivery of electricity, renewables & certificates
- Commenced operations in 2008; CERC regulated
- Publicly listed company – 2017 (NSE and BSE)
- ISO 9001:2015, ISO 27001:2013, ISO 14001:2015
- Market Share incl DAM & RTM is ~100%
- **IEX is on the Board of Association of Power Exchanges (APEx) where 40 Global exchanges are members**
- **IEX has diversified into Gas Exchange (IGX)**
- **IEX is member of 13 State Regulatory Commission advisory committees**
- **Regularly organize Capacity building workshop for state utilities and other participants**

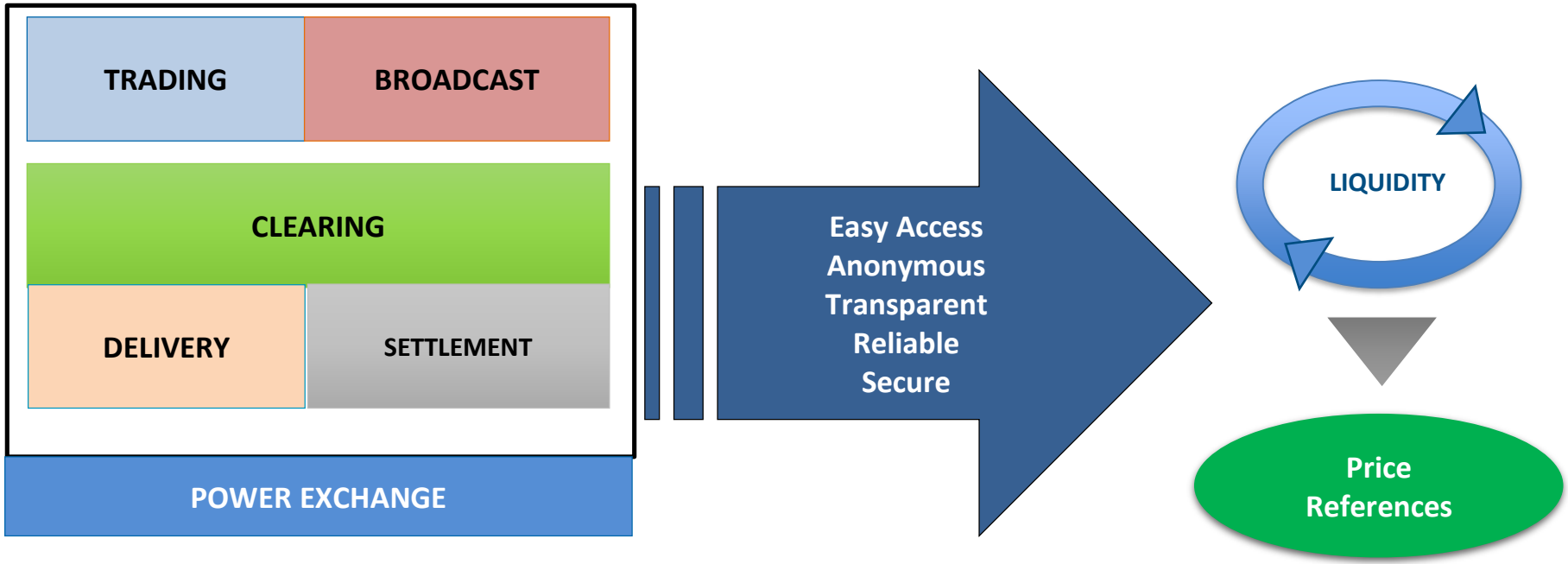
**Robust Ecosystem**

| | |
|---|---|
| **7900+** Registered participants | **4500+** Commercial & Industries |
| **1500+** RE Generators & Obligated Entities | **600+** Generators |
| **55+** Discoms (all) | **100+** ESCert Entities |

**Leading the future of energy with innovation and technology**

# IEX Over the Years – Journey of innovation basis the market

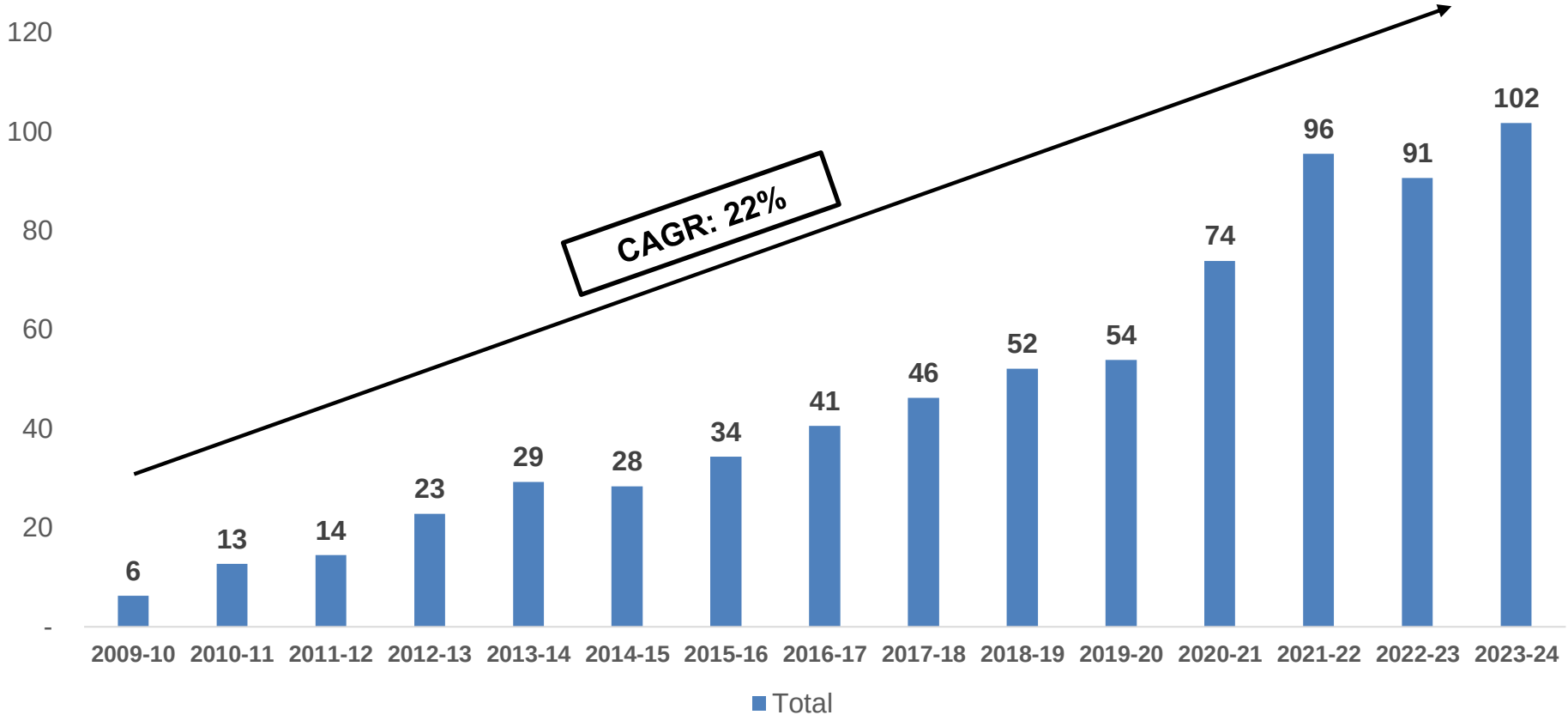
# Power Exchange Broad Functions



# Existing Products & Auction Mechanism

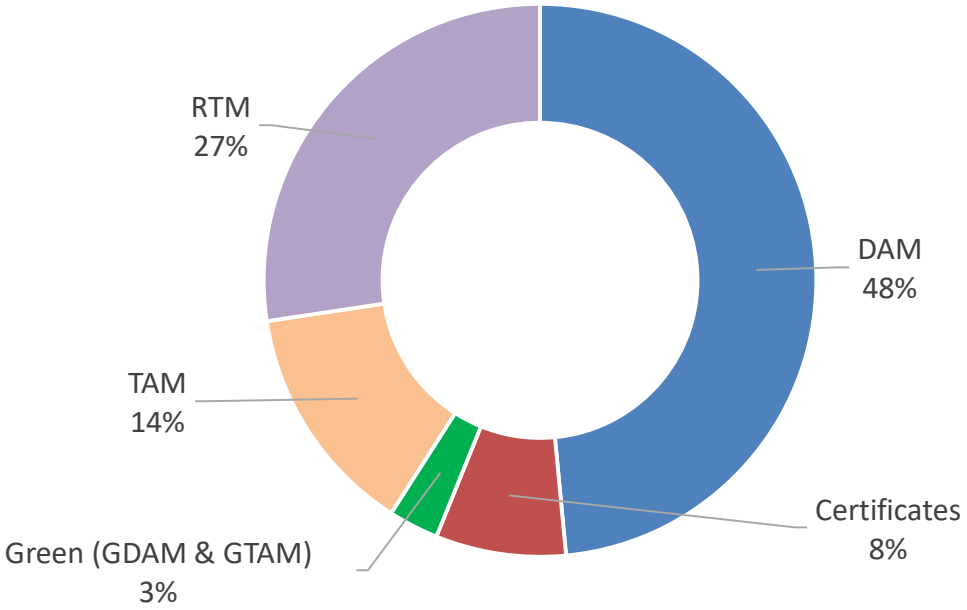
- Integrated DAM - *Closed double sided auction*
  - **G-DAM**
  - DAM (includes Cross Border Trade)
  - High Price DAM
- Real-Time Market (RTM) - *Closed double sided auction*
- Intraday Market (Conv., HP ITD & **Green**) – *Continuous matching*
- Day Ahead Contingency (Conv., HP DAC & **Green**) – *Continuous matching*
- TAM, HP-TAM & **Green TAM** **(up to 3 Months)**
  - Daily, Weekly, Monthly – *Uniform price step auction*
  - Any Day Single-Sided Contract (Conv. & **Green**) – *Reverse auction*
- Tertiary Reserve Ancillary Services (TRAS): AS-DAM & AS-RTM
- **Certificates: RECs & ESCerts** – *Closed double sided auction*

# IEX Electricity Volume (BU)



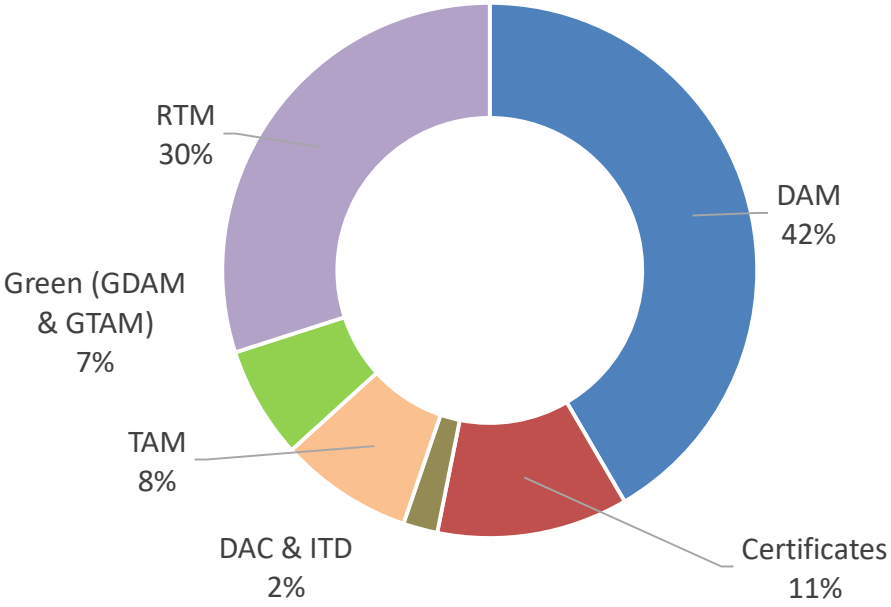
# IEX Product Mix

FY 24



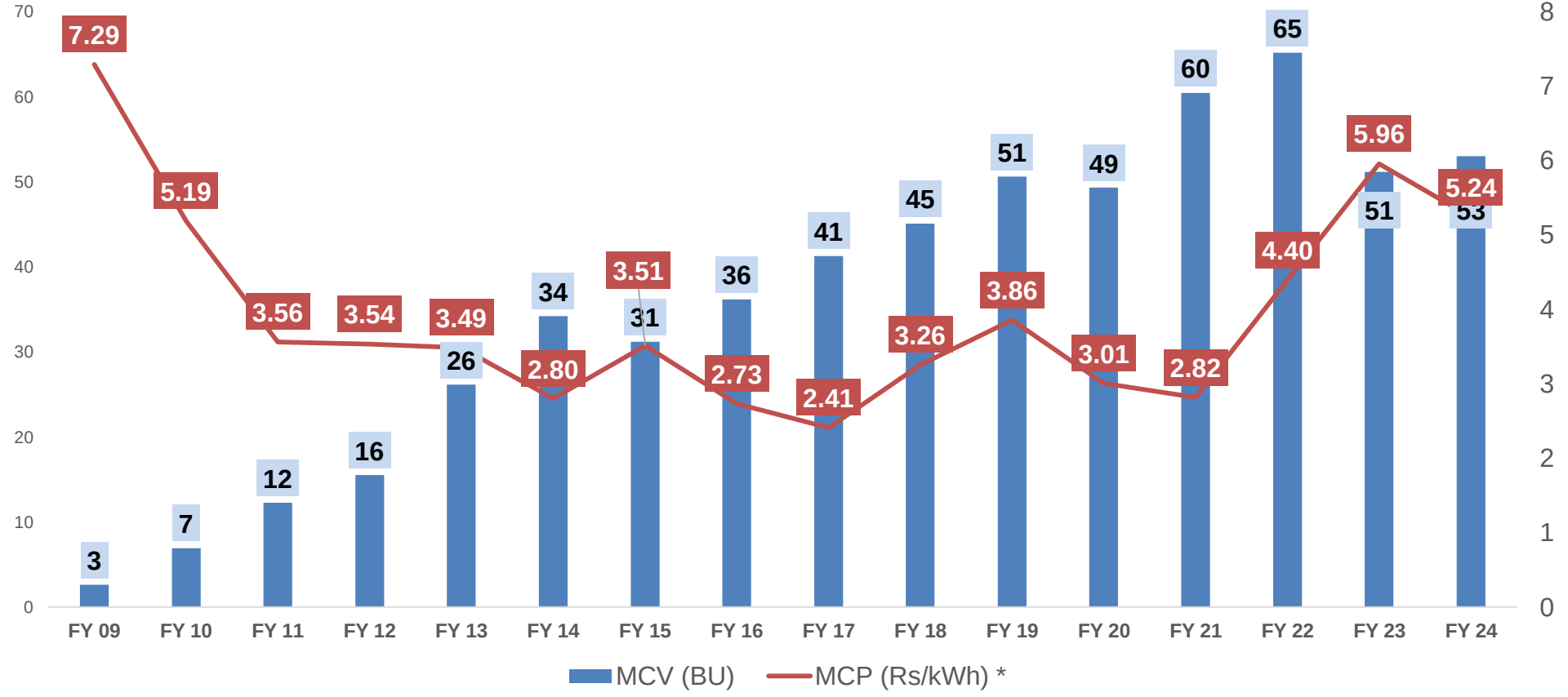

**Total Volume: 110 BU**

FY 25 (7 M)

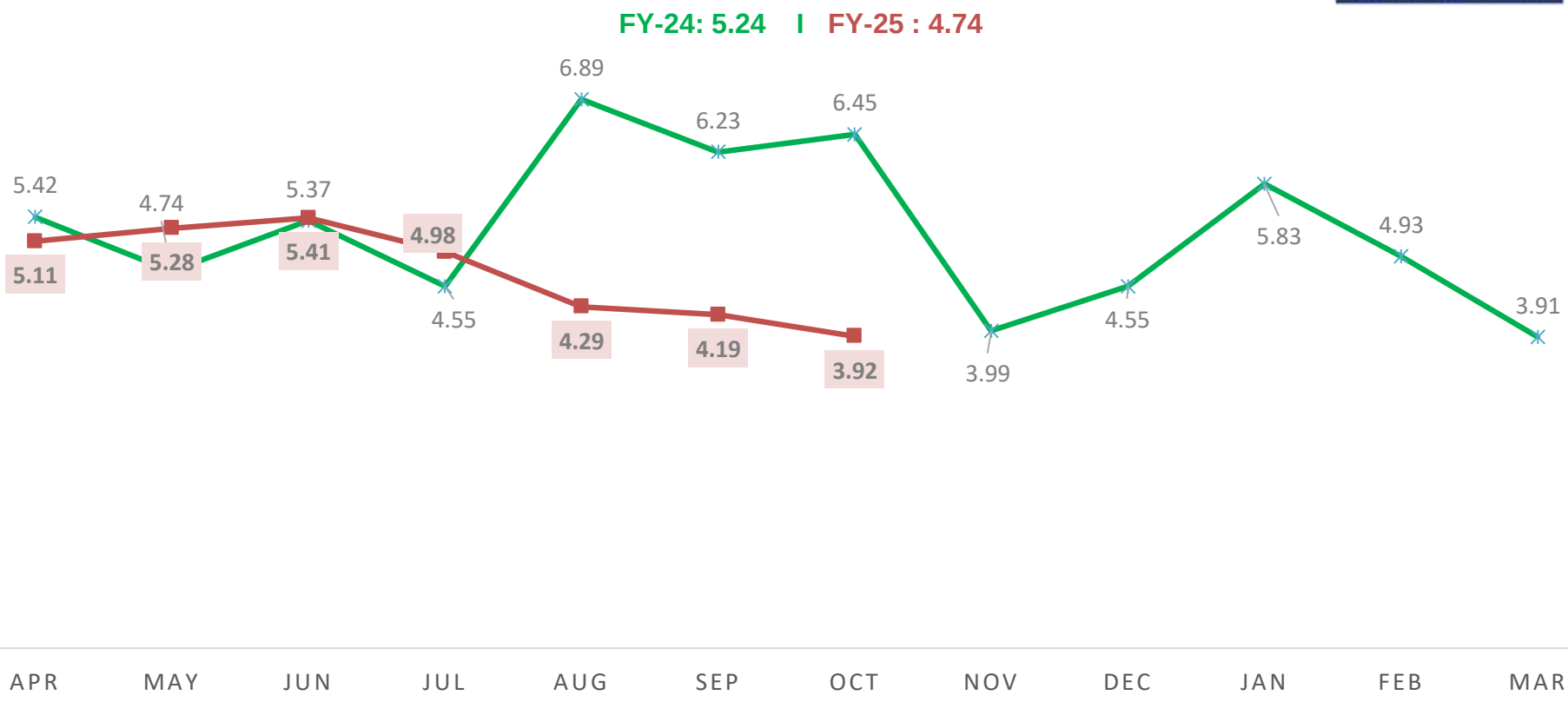



**Total Volume: 77 BU**

# Yearly DAM Snapshot

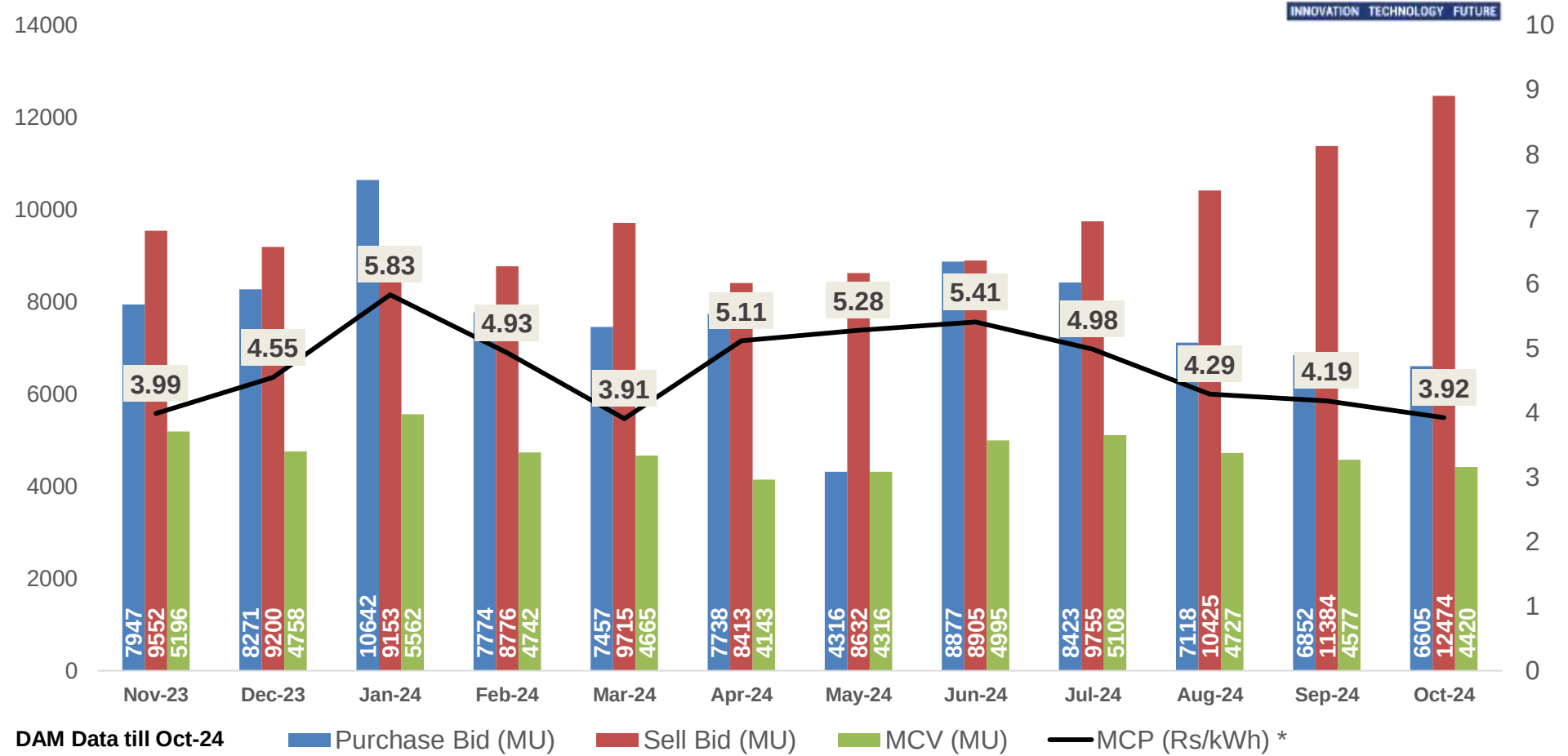


# Price Trends (Rs./kWh) at DAM

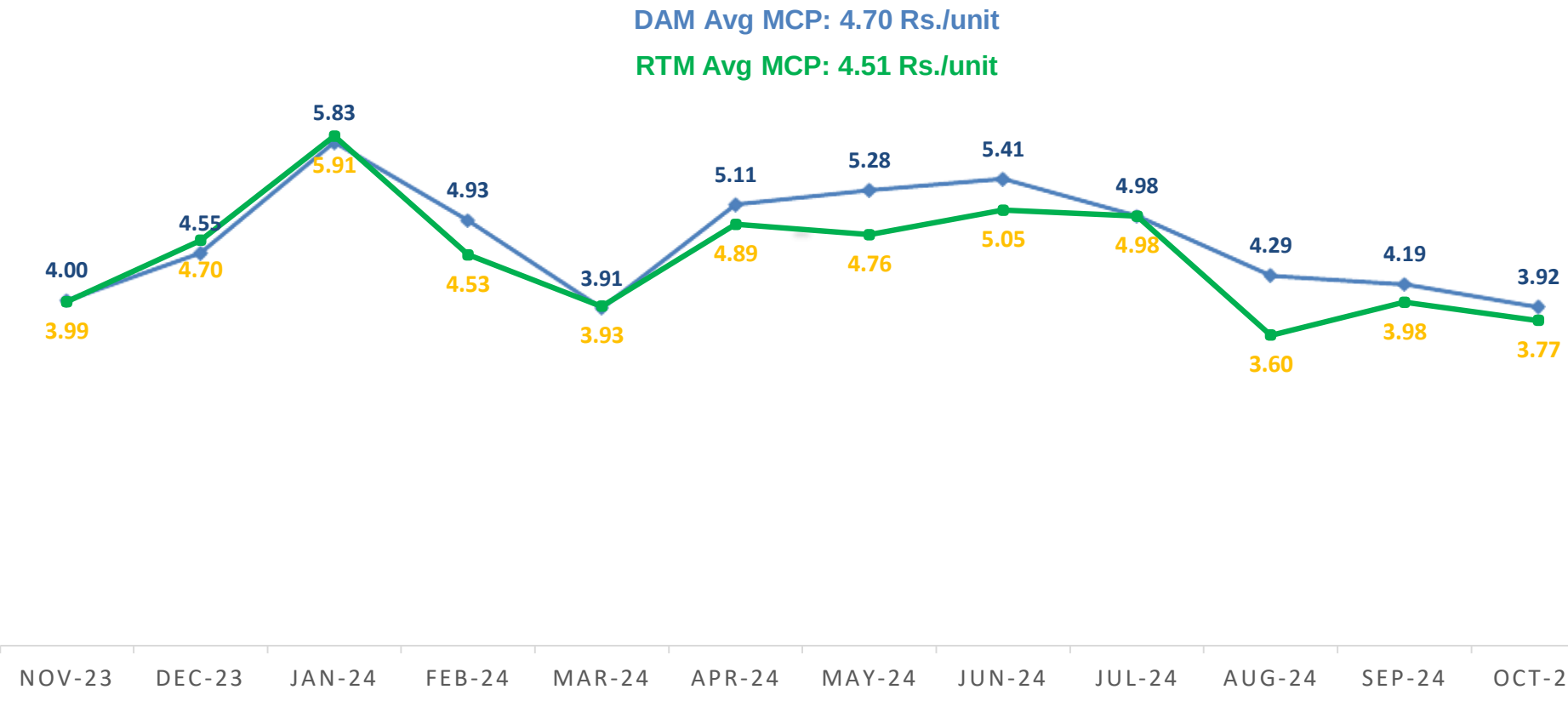



DAM Data till Oct-24

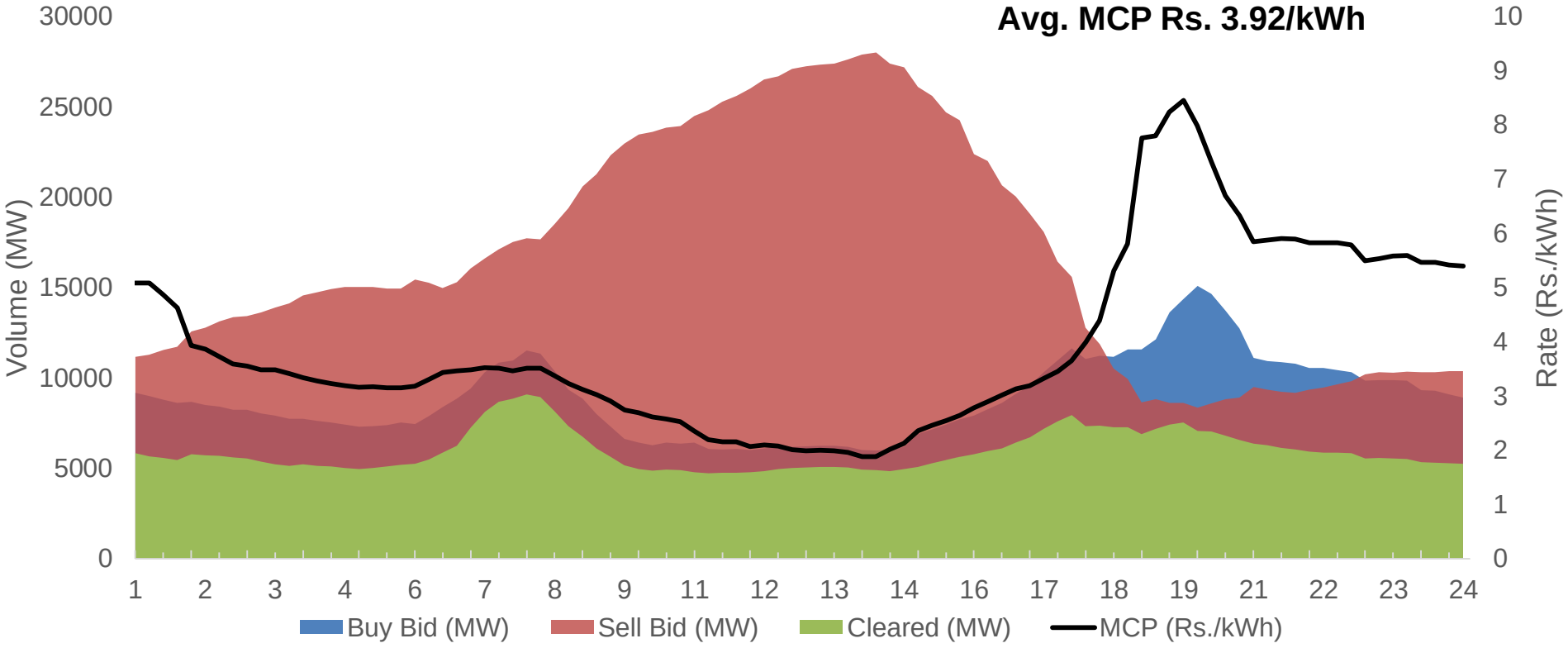
# Monthly DAM Market Snapshot



# Price Trends (Rs./kWh) DAM & RTM (Last 12 Months)



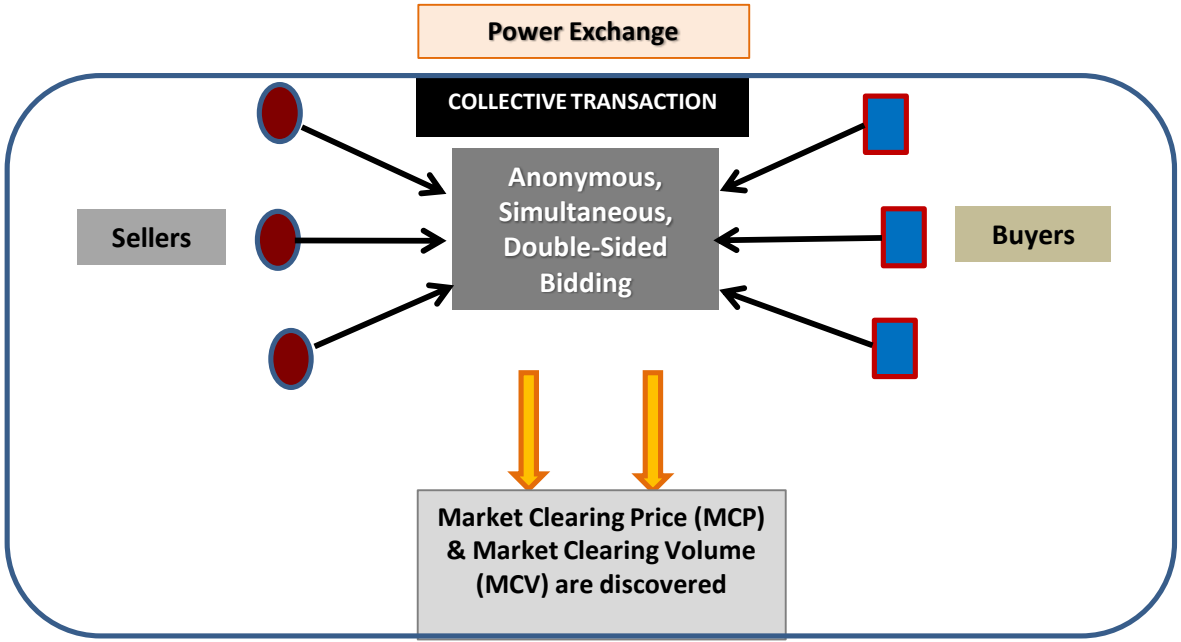
# DAM Snapshot for Month of Oct-24

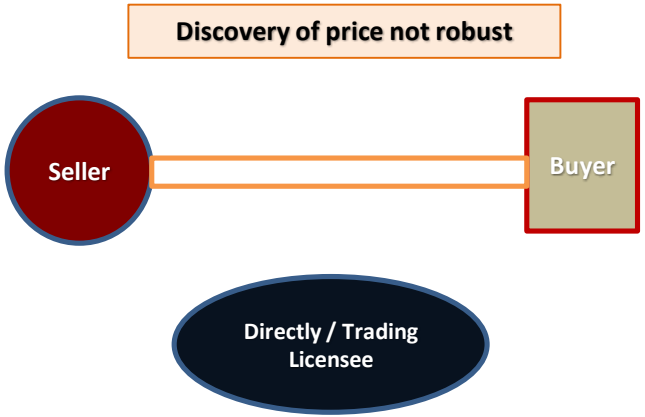



- Hugely surplus availability during solar hour, resulting into lower prices ~Rs. 2.51/kWh providing optimization opportunity

# Bid Matching

# Collective and Bilateral Trades



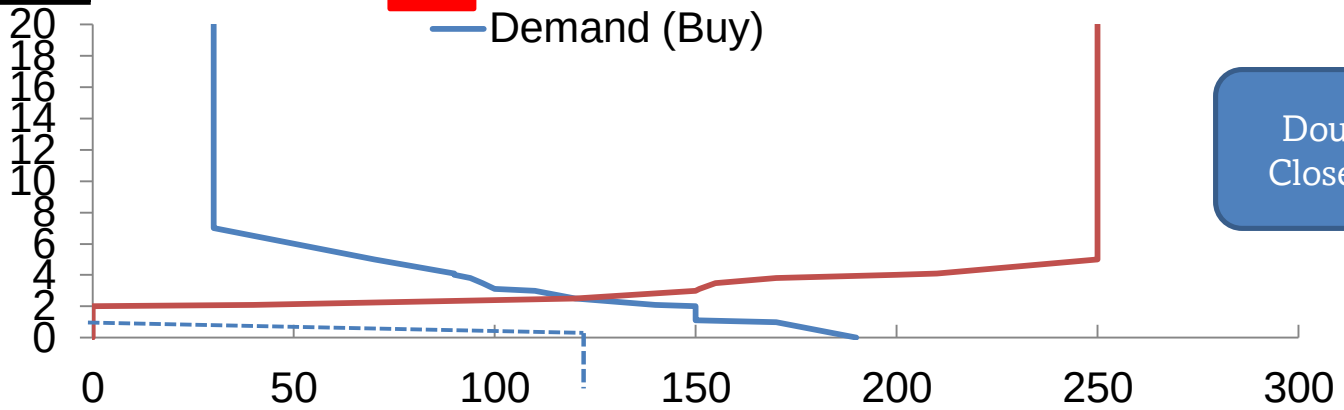




- **Collective transaction** means a set of transactions discovered at the power exchange through anonymous, simultaneous and competitive bidding by buyers and sellers.

- **Bilateral transaction** means a transaction of exchange of electricity between a specified buyer and a specified seller directly or through a trading licensee at a specified point of injection and to a specified point of drawl.

# Matching*: Model Price Calculation algorithm (Example for a sample 15-min- single bids)

| 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 |




Double Sided Closed Auction

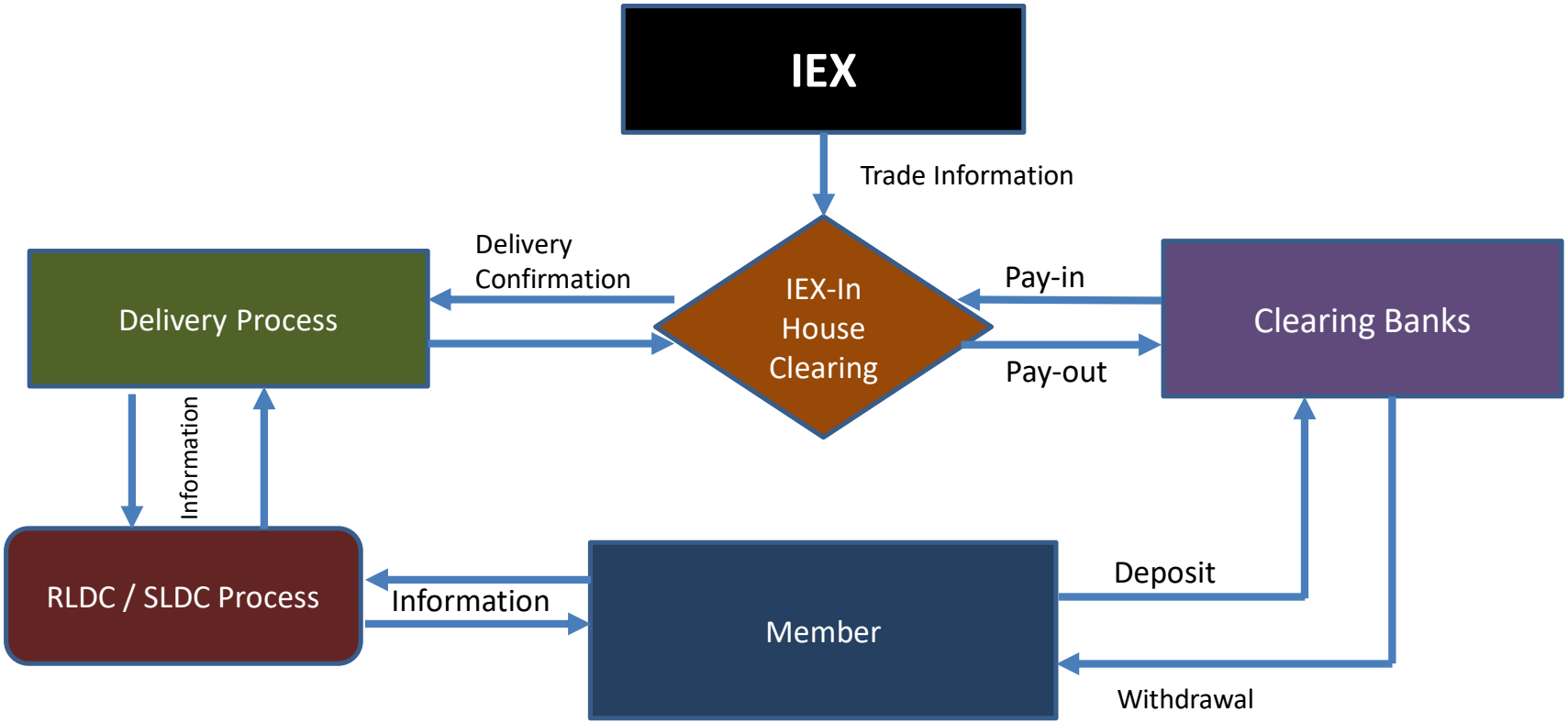
**MCP: Rs 2.5**

**MCV: 120 MW**

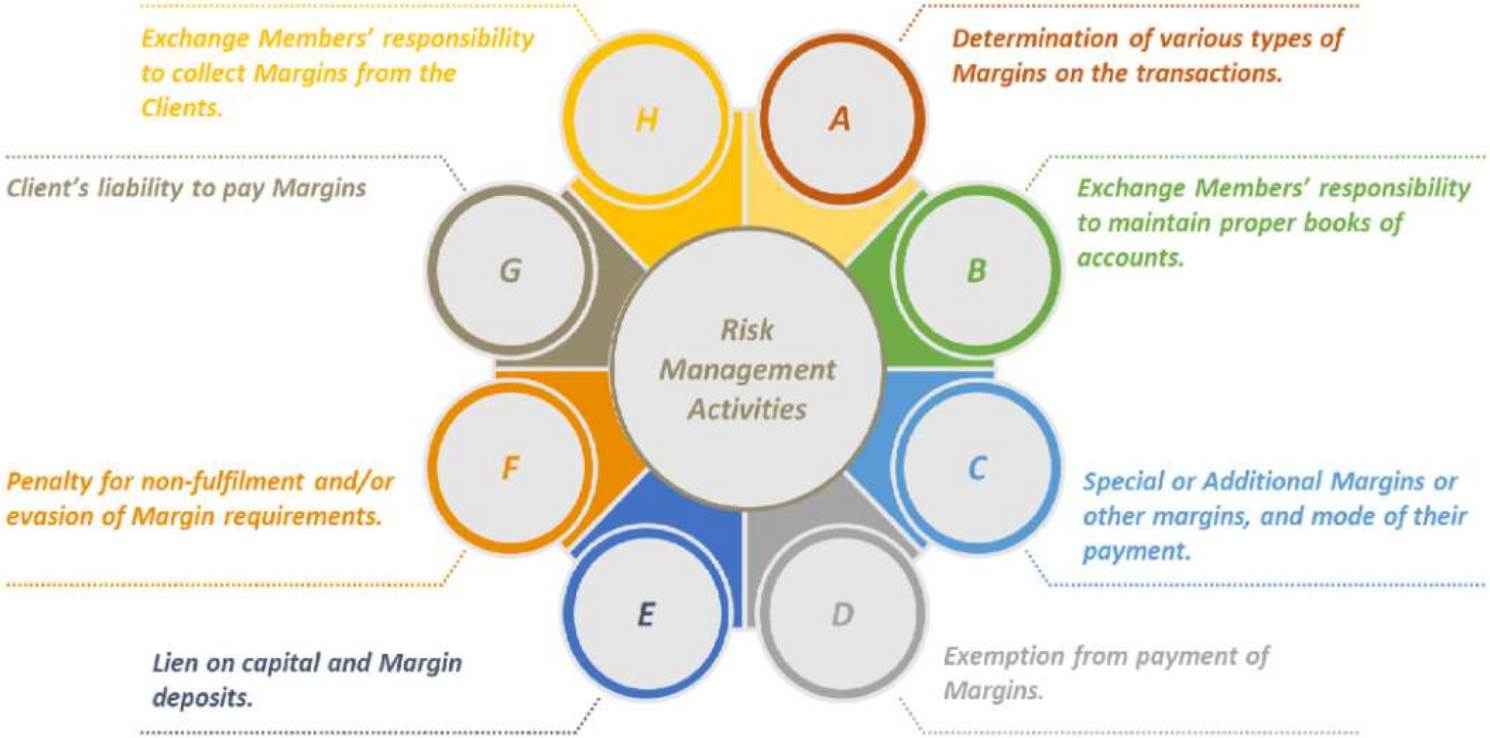
*For DAM and RTM

# Risk Management and Settlement in IEX

# Clearing and Settlement Structure



# Risk Coverage



# Margin

| S. No. | Market Segment/ Contract | Margin |
|---|---|---|
| 1 | IDAM | **Pre-Trade** - Average value of trades of Buyer Member for last seven (7) days |
| 2 | RTM | Nil |
| 3 | Intra Day Contract | **Pre-Trade** - 105% of the order value from buyer. |
| 4 | Day Ahead Contingency Contract | **Pre-Trade** - 105% of the order value from buyer. |
| 5 | TAM – Daily Contracts | **Pre-Trade** - 5% of the order value. **Post-Trade** - 50% of the Trade Value. |
| 6 | TAM- Weekly Contracts | **Pre-Trade** - 5% of the order value. **Post-Trade** - 50% of the Trade Value. |
| 7 | Monthly Contract | **Pre-Trade** - 1% of the order value. **Post-Trade** – 20% of the trade value. |
| 8 | TAM - Any Day Single Sided – Contract | **Pre-Trade** - 30000/MW/Month or part thereof from seller.<br>**Post-Trade -** 50%, 25%, and 20% of the Trade Value for upto 7 days, 15 days and beyond 15 days contracts, respectively. |
| 9 | REC | **Pre-Trade** - 100% of order Value |
| 10 | ESCERTs | **Pre-Trade** - 100% of order Value |

# Settlement Guarantee Fund (SGF)

The Exchanges must establish and maintain a Settlement Guarantee Fund (SGF) to cover defaults by their members or their clients. According to the Power Market Regulations, the Exchanges are required to:

1. Form an SGF Management Committee to oversee the SGF's management.

2. Invest the SGF proceeds in secure investments to ensure the principal amount remains safe.

3. Distribute at least 70% of the returns earned on the initial security deposit during the financial year to the Power Exchange members, based on the amount and duration of their initial deposit.

# CERC DSM Regulations

# CERC DSM Regulations 2024: Highlights

- Frequency band, $f_{band}$: 49.90-50.05 Hz
- Frequency linked DSM proposed for General Sellers, Energy Storage & Buyers
- DSM for RoR, MSW, WS (Wind/Solar/Hybrid) not linked to frequency
- Contract Rate (CR), Normal Rate (NR), Reference Charge Rate (RR) proposed to continue as earlier for DSM rates of different transactions
- Normal Rate to be highest of (A) Wt. Avg. ACP of IDAM of all the Exchanges (B) Wt. Avg. ACP of RTM of all the Exchanges (C) sum of equal weightage of IDAM, RTM and SRAS UP, TRAS UP.
- Buyers recognized in 4 heads- Schedule<=400 MW, Non-RE rich with Schedule>400 MW, RE rich Buyer state (1000<=W+S<5000 MW), Super RE rich Buyer state (W+S>5000 MW)
- Pool a/c deficit (after utilizing the surplus in all a/cs) to be recovered from drawee DICs in proportion to their drawl (50%) & GNA (50%) upto 31.03.2026, after which it'll be recovered in proportion to shortfall of reserves.
- Shortfall in the pool to be recovered from drawee DICs in proportion of their drawal & GNA upto 31.03.2026; from 01.04.2026, in the ratio of the shortfall of reserves allocated by NLDC to such DICs
- In case of a State having net injection at the regional periphery, the deviation charges for such State shall be as applicable to a buyer.
- NLDC to formulate detailed procedure for implementation, maintenance and operation of the National Deviation and Ancillary Services Pool a/c

# GNA and Sharing Regulations

- Deemed GNA for a State shall be average of A during FY 19, 20, FY 21, where:
  - A={0.5*Max ISTS drawl in a time block during the Year}+{0.5*Average of Maximum ISTS drawl in a Day during the Year}

- T-GNA can be applied from 1 time block up to 11 months. Type of T-GNA Applications:
  - Bilateral:
    - Advance T-GNA: For T-GNA starting from D+3 day;
    - Exigency T-GNA: For T-GNA on D, D+1, D+2 day
  - Collective: Application shall be made by the Power Exchanges
- Drawee GNA Grantees will bear the Transmission charges for GNA monthly basis as per the methodology proposed in the Sharing Regulations (Rs/MW);
- T-GNA Rates will be the 1.1* Transmission charges and TDR at 1.35*Transmission charges
- Power Exchanges will collect T-GNA charges over and above GNA charges for the collective transactions and deposit to the NLDC on D+2 basis

- ✓ Buyers to take the GNA and bear the transmission charges & losses
- ✓ GNA and T-GNA to be based on demand and not on the basis of underlying commercial contract
- ✓ Power can be procured from different sources on a day ahead scheduling basis
- ✓ Decision making at the marginal power procurement cost will lead to economic dispatch

# Applicability of Charges and Losses in T-GNA

- ISTS Transmission Charges Rate defined in Rs/MW/Time Block
- Applicable Charges
  - ISTS Transmission Charges & Losses on drawl (buy).
- Non-applicability of Charges/Losses
  - NLDC Scheduling & Operating Charges
  - ISTS Transmission Charges & Losses on injection (sell).
  - Supply from alternate source
- No Changes in applicability of State Charges and losses (applicable as informed by SLDCs).

✓ The arbitrage between the collective transactions and bilateral transactions has been done away with.

# Open Access Charges

- ISTS Charges & Losses
- Transmission Charge & Losses
- Wheeling Charge & Losses
- Cross Subsidy Surcharge
- Additional Surcharge
- NLDC Operating and Scheduling Charges
- Trading Margin

# Impact of Green Open Access

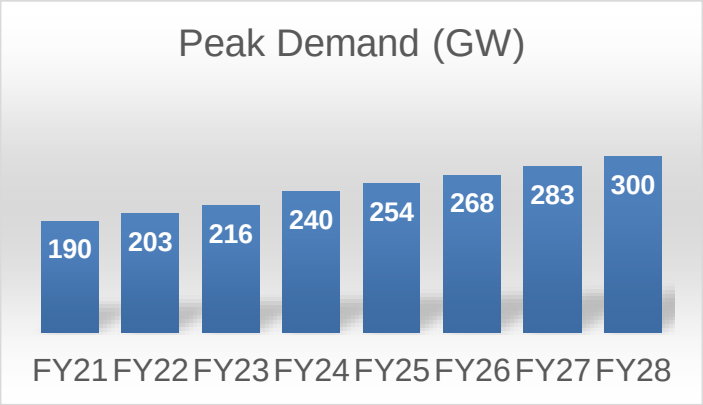
| Particulars | Solar | Wind | Hybrid | Renewable Energy |
|---|---|---|---|---|
| **Regulations/ Policies** | ✓ | ✓ | ✓ | ✓ |
| **Capacity Restriction** | No restriction on installed capacity | Up to 50% of contract demand | Up to 50% of contract demand | No restriction on installed capacity |
| **Operative period** | Valid up to 31st December 2025 | Valid up to 31st March 2023 | Valid up to 19th June 2023 | Valid up to 30th Sep 2028 |
| **State Transmission Charges** | Transmission charges are applicable on the entire capacity booked | Transmission charges are applicable on the entire capacity booked | Transmission charges are applicable on the entire capacity booked | Transmission charges are applicable on the entire capacity booked |
| **Electricity Duty** | Exempted | Exempted | Exempted | Exempted |
| **Banking** | • Available @ ₹1.50/kWh.<br>• Energy set off shall be allowed between 07 hours to 18 hours of same day | Monthly Banking @ 2% charge | Monthly Banking | Monthly Banking @ ₹1.50/kWh |
| **Waiver of CSS & AS for Third Party** | Not Applicable | 50% Rebate | 50% Rebate | Partial waiver |
| **Treatment of surplus energy** | Surplus energy to be purchased by Discom @ latest rate discovered | Surplus energy to be purchased by Discom @ latest rate discovered | Surplus energy to be purchased by Discom @ latest rate discovered | Surplus energy will lapse |

# Way Forward

# Projected demand growth for next 5 years

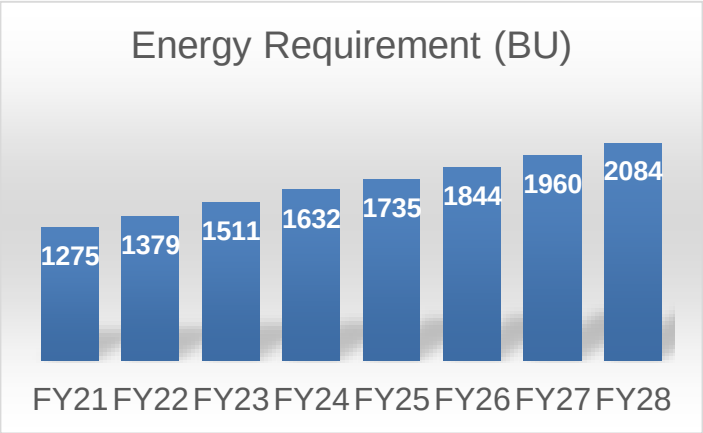
**Assumptions for Peak demand Trends**

- Actual CAGR of Peak demand growth of FY22, FY23 & FY24 is 5.7% and the same has been used to extrapolate Peak demand till FY28.
- CEA's recent forecast of Peak demand of 256 GW for FY25 also indicates that Peak demand growth of 5.7% is reasonable & most likely.




**Assumptions for Energy requirement trends**

- CEA's long-term electricity demand forecast report has projected Electricity demand growth of 6.35% over FY27 to FY37.
- Looking at the current trends, electricity demand growth rate at CAGR 6.3% looks most likely with GDP growth rate expected around 7% & electricity intensity to GDP growth rate at ~ 0.91.
- For FY24, 8% YoY growth has been considered and for subsequent FYs 6.3% CAGR has been used to extrapolate till FY28



# Key factors over next few months

- ✓ Weather: According to the India Meteorological Department (IMD), La Nina conditions are likely to develop in India. Monsoon season has brought above-average rainfall.
- ✓ Mandatory offering of URS power is playing a critical role and ensuring optimal utilization of resources leading to competitive price discovery on DAM & RTM
- ✓ Capacity addition: From Sept 2023 to Sept 2024, ~26.6 GW capacity has been added with a percentage increase of almost 6% (~19 GW Solar Capacity Installed)
- ✓ Domestic coal availability of almost 13 days [One of the highest ever during / after monsoon season]
- ✓ Storage available in reservoirs as per October Bulletin is 118% of the storage of corresponding period of last year and 114% of Normal storage
- ✓ Imported coal prices are currently on lower side and expected to continue to be lower
- ✓ Government intervention: Gas Prices capped at $10.16/MMBtu till 31$^{st}$ March 25.
- ✓ Key power procurers: In Winters apart from Rajasthan hilly states like JK, UK and HP are only major buyers.

# IEX: Future Opportunities

| | |
|---|---|
| New Products | ➢ IEX planning to introduce TAM Contracts up-to 11 months, petition has been file in Nov'23<br>➢ RE capacity through exchanges; Contract for Differences; Deepen Ancillary Market<br>➢ Launch of Derivatives will provide price hedging opportunity and lead to lower volatility in prices thereby increasing liquidity in the spot market<br>➢ GOI issued order for allowing electricity to be traded as other commodities, Long positions on electricity contracts can be hedged very soon.<br>➢ Capacity Market |
| Contracts for Difference (CfDs) | ➢ CfD model beneficial for RE generators, provides long-term stable price to mitigate project development and finance risks<br>➢ Under market-based CfD mechanism for RE, power traded and scheduled at PXs at market prices<br>➢ If discovered market price > strike price, generator pays difference to pool maintained by Government entity. If market price < strike price, pool pays difference to generator |
| P2P Trading | ➢ P2P trading of electricity is emerging in different parts of the world due to increasing number of Prosumers<br>➢ IEX through its MoU Partners ISGF & Power Ledger, Australia has been jointly exploring P2P opportunities in various states.<br>➢ The Guidelines have been issued in UP and draft guideline has been issued by DERC. |

# Launch of IEX Academy; Price Index - PowerX

- ✓ Launched in June to create pool of skilled professionals for capacity building in the power market
- ✓ Customized certification courses to develop skills and expertise in Electricity Markets across topics such as power sector policies, regulatory frameworks, and power exchange operations
- ✓ Courses designed based on in-house experience of IEX, and in collaboration with academic institutions and think tanks.

- ✓ Launched IEX Power Price Index – 'PowerX' – India's first Electricity Price Index.
- ✓ Provides competitive benchmark signals and enable market participants to make more effective decisions.
- ✓ Calculated based on weighted average price of Day-Ahead Market and Real-Time Market.

# Thank you

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