FUNCTIONING OF POWER EXCHANGES

Markets

Market

"Market is a mechanism for matching supply and demand for a commodity through the discovery of an equilibrium price"

Requisites for Creation & Classification of Markets

- Quality
- Quantity
- Price
- Date of Delivery
- Mode of Settlement
- Conditions to Contract

Commodity

"A basic good used in commerce that is interchangeable with other commodities of the same type"

Characteristics

- Product should be essentially uniform across producers
- Often used as inputs in production of other goods and services, i.e. large scale utility
- To trade on an Exchange, a commodity must meet specified minimum standards, known as Basis Grade

Eg: Grains, Gold, Oil, Natural Gas, Foreign Currencies, Electricity etc.

Indian Electricity Market

Market	Remarks
Open Electricity Energy Market	
Long-Term Market	PPA
OTC Forward Market	Bilateral
Power Exchange	Day-Ahead Market/Term-Ahead Market
Derivative Market	No

Transmission corridor allocation to market Segments

	Segment		Market Share	Delivery Duration	Allocation Method
1	Long Term		91%	Exceeding 7 Yrs	**FCFS**
2	Medium Term		<1%	3 M to 3 Yrs	**FCFS**
3	Short Term – Bilateral	Advance	4%	upto a calendar month	**FCFS** (prorata or e-bidding in case of congestion)
		FCFS			
		Day Ahead			
		Contingency			
4	Short Term – Collective (DAM)		3%	1 day	**Implicit Auction** (prorata b/w PXs)
5	DSM (UI)		2%	Same day	-

Key Participants in Power Exchange Landscape

Producers

- Independent Power Producers
- Captive Power Plants
- State Utilities
- Inter-State & Central Generating System

- Exchange provides generators convenient access to multiple buyers of power

Intermediaries

Policy & Planning

- Ministry of Power
- Central Electricity Authority
- State Government

Regulation

- Central/State Electricity Regulatory Commission (CERC/ SERC)

Transmission

- Transmission Licensees
- Central/State Transmission Utility

System Operators

- National/ Regional/ State Load Dispatch Centers (NLDC/ RLDC/ SLDC)

Market Operators

- Trading Licensees
- Power Exchanges

Distribution

- State/ Private DISCOMs

Customers

- Industrial Consumers
- DISCOMs
- Institutional Consumers

- **Multi-buyer model**
- Discoms buy power to manage demand variation and optimise power purchase cost
- Open access allows industrial consumers to directly purchase electricity from selling parties in the exchange

Open Access is a win-win solution for all stakeholders

Industries

- Reliable power supply
- Source cheaper power
- Save the value of lost load (VOLL)

State utilities (Discom & SLDC)

- Cost savings , need not have to buy costly power as per merit order
- Serve retail consumers better
- Financial gains through open access charges

Open Access Benefits

State

- Increase in per capita consumption
- Revenue addition in terms of taxes
- Build up in generation capacities
- Employment generation
- Promote industrial & economic growth

Retail Consumers

- Increased availability
- Better reliability of power
- Benefits trickle down to consumers in terms of low prices of products

Functions of Power Exchange

IEX - India's Premier Power Exchange

01 Fast Growing Sector & Conducive Government Policies

- Increasing power surplus to drive short term power trading market
- Robust transmission system
- GoI policies such as 27*7 power for all , Make in India will lead to increase in demand.

02 India's first & largest power exchange

- Trusted exchange with high brand loyalty.
- Dominant market share of 94.9% of traded volumes in India in DAM, TAM and REC combined(1)

03 Efficient Price Discovery and Flexibility

- Transparent & automated online platform providing efficient price discovery
- Provides flexibility of granular trading in variety of electricity products to manage requirement efficiently.

04 Diverse Participant Base Ensuring liquidity

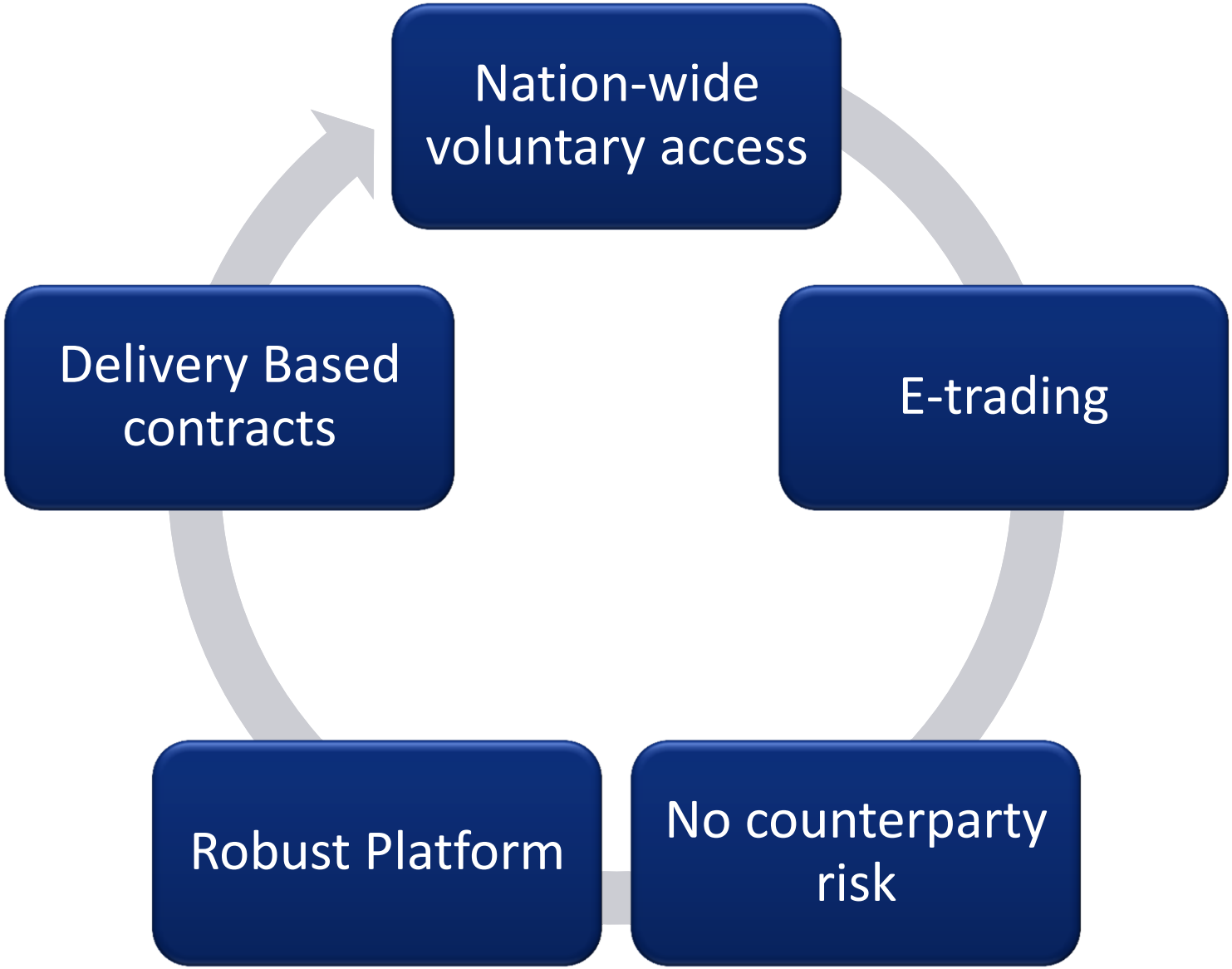
- >5,800 registered participants including all distribution companies, >400 electricity generators and >3,800 industry/commercial consumers(2) across county.

05 Rapidly Growing Trade Volumes

06 Robust and Scalable Technology

- Technology capable to handle 1 lakh participants against present participation of 5800
- Capable to handle 30 bid areas as against present 13

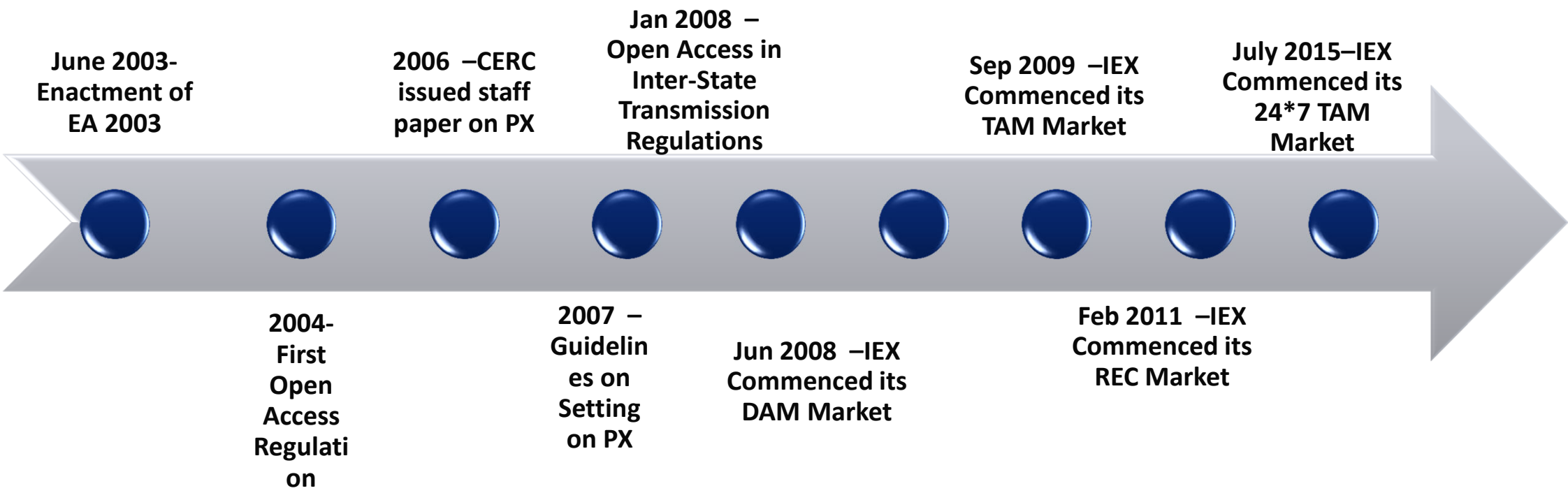
What benefits does the power exchange provide?



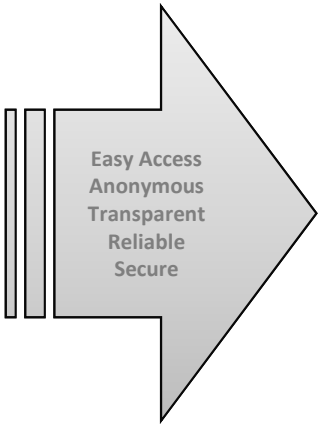
Role of Power Exchange

- A neutral and easy access to the marketplace
- Standardized Contract
- Offers "law of One Price"
- An automatic interface.
- Clearing & settlement of deals
- Security by being a safe counterpart
- Information dissemination among the participants

Evolution of Competitive Power Market



PX Characteristics



Easy Access

Automated live trading system

Anonymous

Closed bidding environment

Transparent

Demutualised, with oversight committees set by regulator.

Standardised risk management, with regulatory oversight.

Trade results made public

Reliable

Disaster Recover site

Established C&S, with no defaults till date

Secure

Terminals connected through MPLS and SSL only.

Surveillance room with necessary security (Separate network, Restricted biometric access, Video & Audio recording).

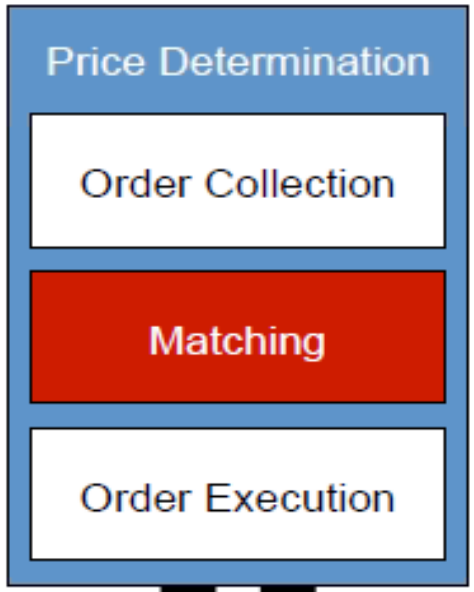
Periodic IT system audit for data security, data integrity and operational efficiency. Automated audit trail

IEX Self Regulating Institution

- Due diligence before Membership
- Networth Criteria
- Security deposit & Margins
- Voluntary participation
- IEX Counterparty
- SLDC Clearance

Understanding exchange mechanism

Power Exchange- Operations

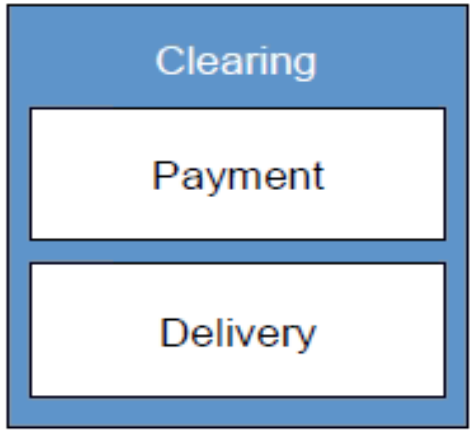


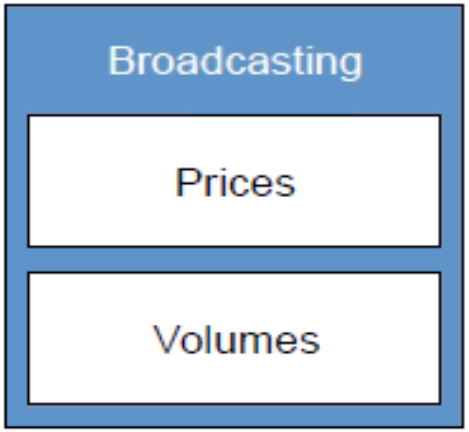
Surveillance Function:

- Performed from a secure 'Surveillance Room' with restricted access
- Surveillance Committee reports to CERC quarterly

C&S Function:

- Separate Clearing & Delivery cells
- Risk Mgmt. Committee reports to CERC half yearly





Surv. Function:

- Results displayed on trading terminals
- Market results, including curves published online
- Monthly report to CERC

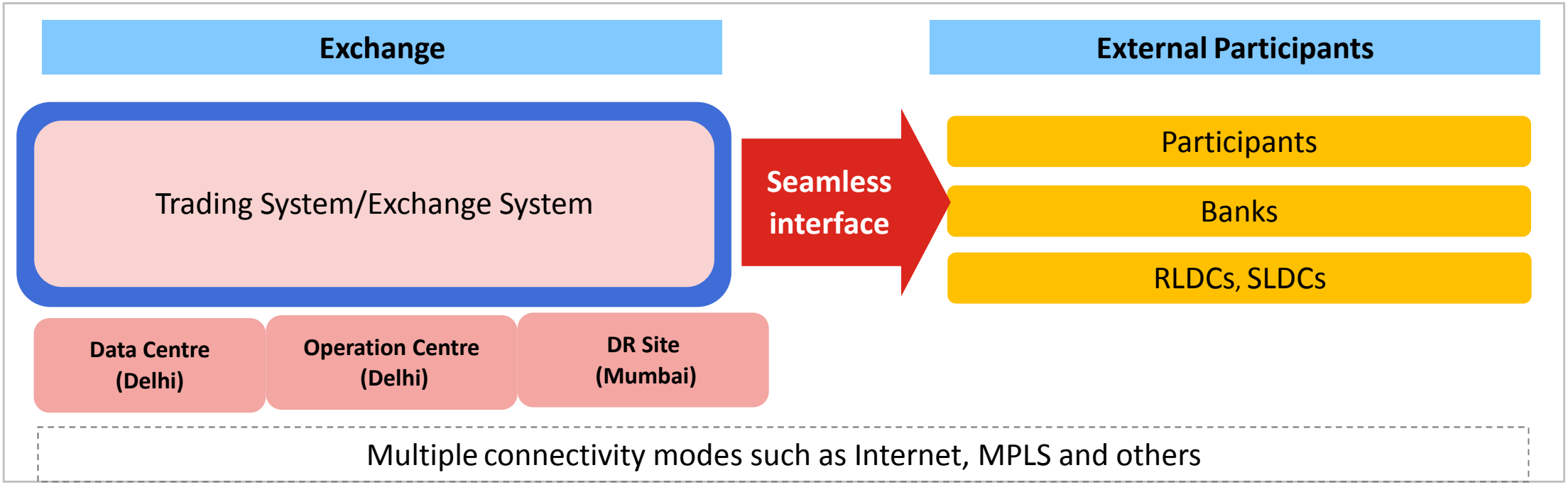
Exchange Operations Covers -

- Surveillance
- Clearing and Settlement
- Delivery and Scheduling

Inside IEX

- Surveillance department of IEX is under continuous online CCTV monitoring and recording
- All Telephonic conversations are recorded with no out going facility
- The Heart of the exchange i.e. Surveillance room, is secured by limited and authorized access and that too with Biometric sensor access
- All authorized persons of Surveillance room are not allowed to use any communicating medium (mobile phones)
- All process flow is documented in the form of check lists which is authorized by HOD.
- Concurrent Audit of the checklist by internal auditors

IEX | Robust & Scalable Technology Platform



Highlights of PowerARMS

- Trading & Settlement in cross-country/regional markets
- Wide range of multiple order types, like Single bid, Block bid, Linked bids
- Integrated automated real-time risk management & computation of financial obligations
- Seamless interface with participants, banks, TSO/ RLDCs & SLDCs
- Extensive reports and audit trails

Highly scalable and proven technology infrastructure

Technology is a key component of operations and business strategy

- **Robust software**
  - Efficiently handles online bidding, bid matching, trading, scheduling & settlement of trades
- **Ensures critical attributes** for exchange based trading such as:
  - Maintain the anonymity of bids
  - Integrity of the price discovery mechanism
  - Implementation of risk management procedures
- **Highly scalable platform**
  - System can **handle up to 100,000 participants** at relatively low cost against 5,800 presently
- **Key operational functionalities** provided by the system:
  - Double sided closed auction with uniform price discovery in DAM along-with capability to derive results under grid condition of power transmission congestion
  - Continuous trade sessions with matching based on price & time priority for intra-day, daily & day-ahead contingency contracts and weekly contracts via uniform price auction in Term Ahead Market (TAM) segment

Regulations

Regulatory Boost for Power Market Development
(1/2)

- **EA 2003 and enabling provisions on Power Market**

  The intent and object of the EA 2003 is to develop power market through increased competition, more players and protect consumer interests

  - Development of Power Market – EA 2003, Section 66, "The Appropriate Commission shall endeavor to promote the development of power market…", guided by ***the National Electricity Policy***
  - Suitable safeguards to prevent adverse effect on competition
  - Recognized Trading as a distinct activity. Defined under section(2) (47): "Purchase of electricity for resale thereof"

CERC Open Access Regulation, 2004

Products:

- Long-Term Open Access>25 Years; Nodal Agency-CTU
- Short-Term Open Access<1 Year; Nodal Agency-RLDC; FCFS Basis

First Amendment Open Access Regulation, 2005

New Products Introduced in STOA:

- Advance Scheduling up to 3 months in advance
- First-Come-First-Served basis
- Day-Ahead
- Intra-Day

2006-2007: Discussion Process for Establishment of Power Exchange

- CERC Staff Paper ('06) on "Developing a common platform for electricity trading"
  - One PX or Multiple PX, PX to be voluntary or Mandatory, Price Discovery and Congestion Management was discussed with international experiences of power exchanges.

- CERC guidelines in Feb 2007 for grant of permission for setting up and operation of Power Exchange.

CERC Open Access Regulation, 2008

- Regulation covers only Short-Term Open Access Transaction
- Transactions Categorized as Bilateral and Collective (thru Power Exchange)
- Nodal Agency for Bilateral- RLDCs; Collective-NLDC
- Transmission Charges moved from “Contract Path” to “Point of Connection” for Collective Transaction
- Both Buyers and Sellers of Collective transactions to bear transmission charges and absorb transmission losses
- SLDC Consent mandated along with Application

Establishment Process of IEX

- IEX made an application for grant of permission to setup a Power Exchange in March 2007.
- IEX received an in-principle approval from CERC on August 2007.
- IEX commenced its Day-ahead Market operations from June 2008.
- IEX commenced its Term-Ahead Market Segment in Sep’2009.
- IEX commenced its REC Segment in Feb’ 2011.

Features of Power Market Regulations, 2010

Role of PXs defined and norms for setting up and operating PX

- Procedure for application, eligibility criteria, shareholding pattern, Net worth, risk management by PX,

CERC approval for setting up a PX and oversight for contracts offered

Objectives for PX

- Ensure fair, neutral, efficient and robust price discovery
- Provide extensive and quick price dissemination
- Design standardised contracts and work towards increasing liquidity in contracts

Defined principle of price discovery for the exchange

- Economic principle of social welfare maximisation
- Closed double sided bidding, uniform price discovery, market splitting for congestion management

Regulatory Environment for PXs

Macro

- By CERC
- Power Market Regulations, 2010

- Prudential norms for PX
- Norms for shareholding pattern
- Governance structure
- Principles of Market Design
- Registration
- Clearing Corporation
- Market Oversight
- Approval or Suspension of Contracts
- Settlement Guarantee Fund
- Exit scheme
- Periodic reporting

Micro

- By PXs (self regulation)
- PX Rules and Byelaws, as approved by commission

- Membership norms
- Risk Management Mechanism
- Contract Specifications
- Matching mechanism
- Clearing
- Penalty for Contractual Deviation
- Grievances redressal mechanism

IEX Self Regulating Institution

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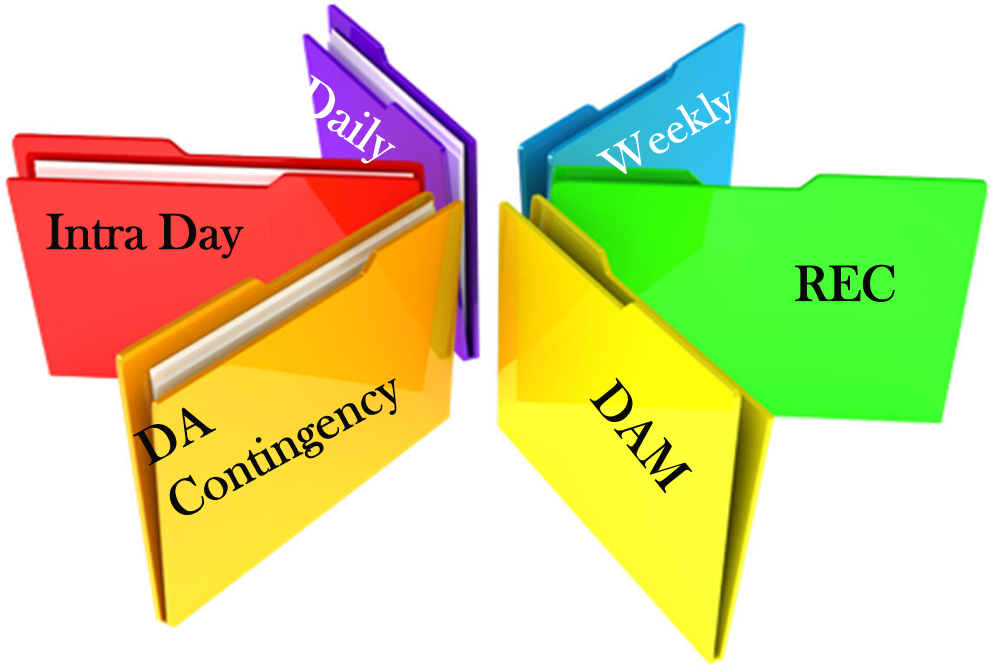


Product Portfolio

Products on IEX

Delivery-based Contracts

Day-Ahead Market
since June,08

Closed , Double-sided Auction
10-12 am bidding
Each 15-min block , 0.1 MW min NOC required

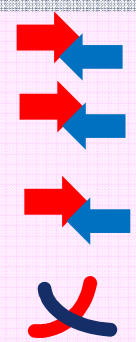
Term-Ahead Market
since Sep,09

Day-Ahead Contingency *– Another window 3-5pm*

Intra-Day *- for the same day starting 2 pm*

Daily- *for rolling seven days (delivery starting after 4 days)*

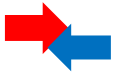
Weekly- *for 1 week (Monday-Sunday)*



Renewable Energy Certificates
since Feb,11

Green Attributes as Certificates
Sellers : *RE generators not under feed in tariffs*
Buyers: *Obligated entities*
1MWh equivalent to 1 REC

Auction



Continuous

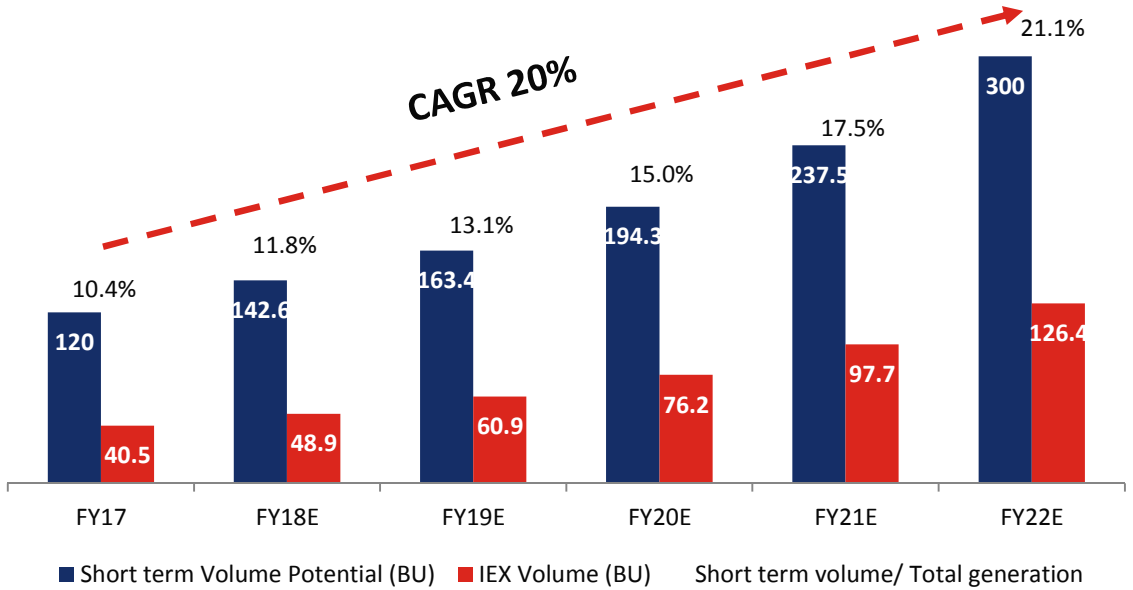
Short Term Power Trading in India – Growth Outlook and Key Drivers

India Power Sector | Key Market Segments

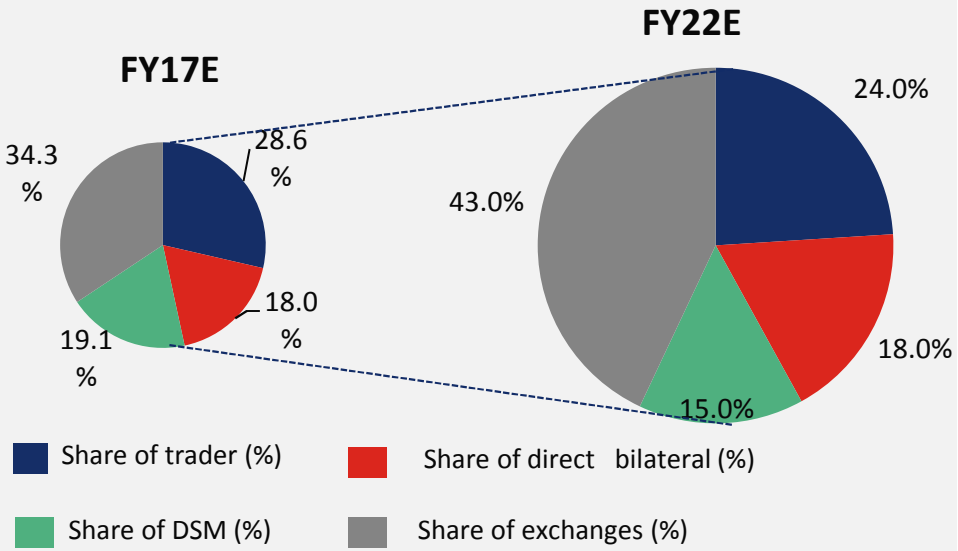
Long Term	Short Term (Contracts less than 1 year) & Its Constituents			
89.6%	10.4%			
Up to 25 years	Inter-state Trading Licenses *Market share – 28.6%(1)*	Power Exchanges *Market share – 34.3%(1)*	Deviation Settlement Mechanism *Market share – 19.1%(1)*	Direct Bilateral *Market share – 18.0%(1)*

Short Term Market Volumes on a rise

Short-term power market forecast (in billion units / percentage)



Market Share Movement within Short term Markets



Source: CRIS report titled 'Short-term power market in India

(1) For FY17E

Framework of Power Market in India

Generators

- Captive Power Plants (250)
- Independent Power Prod. (106)
- Central Generating Stations (65)

Market Operators

- Power Exchanges (2)
- Trading Licensees (43)

System Operators

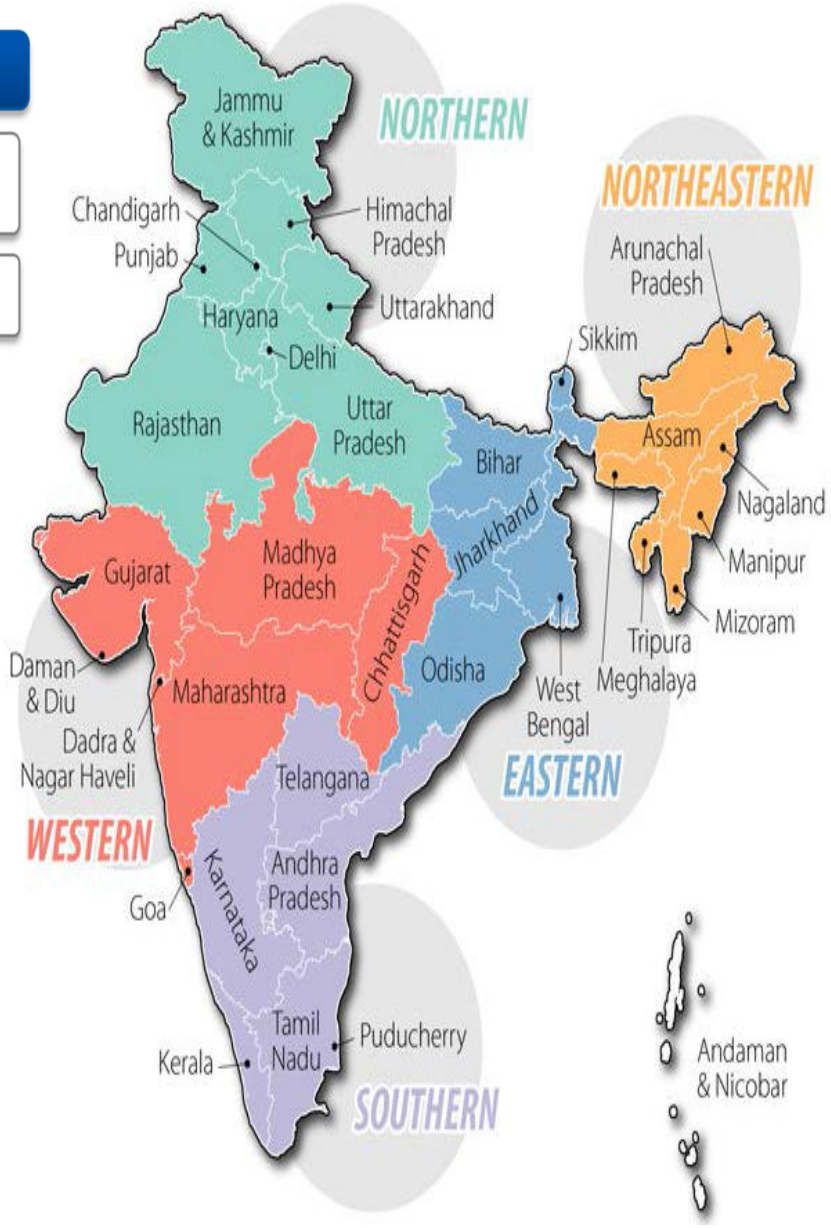
- National Load Dispatch Center
- Regional Load Dispatch Centers (5)
- State Load Dispatch Centers (25)

Regulators

- Central Electricity Regulatory Commission (CERC)
- State Electricity Regulatory Commissions (29 SERCs)

Customers

- Open Access Industrial Customers (3900)
- Load Serving Entities (62)



THANK YOU

IEX
INDIAN ENERGY EXCHANGE