

Short Term Power Procurement- Regulations & Practices

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In this presentation

Policy and Regulatory Enablers



Structure & Status of Short term market



Working and practices of short term market



POLICY & REGULATORY ENABLERS FOR SHORT TERM POWER MARKET

Power Sector Pre- Electricity Act,2003

Power
Sector Pre-
Electricity
Act,2003

Monopoly Suppliers (SEBs, Private Licensees)

Generators (CGSs, IPPs and SEBs) with capacity fully tied up

Each SEB had an allocated share in a Central/ Jointly owned station

Price setting by Central/ State Governments – SEBs hardly had any say

Entire sector developed on fixed rate return

Interplay of market forces remained non-existent

Utilities would back-down in case of low demand and resort to load shedding in case of excess demand

Power as tradable resource did not exist in this cost based regime

Legislative, Policy and Regulatory Developments

Policy/Legislation/Regulation	Year	Key Focus
Electricity Act	2003	Sector re-organisation and competitive markets
National Electricity Policy	2005	Overall sector development
National Tariff Policy	2006	Performance based regulation
Guidelines for Competitive Bidding	2006	Transparent tariff based bidding for new generation
Hydropower policy	2008	Accelerated hydropower development
Terms and Conditions of Tariff, CERC	2009	Generation and Transmission tariff determination
Indian Electricity Grid Code Regulations	2010	Grid operations with competitive markets and renewables
REC Regulations	2010	Trading of renewable energy certificates
Power Market Regulations	2010	Transparent power market operations
Sharing of Transmission Charges Regulations	2010	Efficient transmission pricing

Legislative Enabler for operationalization of Power Markets in India : Electricity Act 2003

- **Intent of the Act was to promote competition** by “freeing” all possible avenues of procurement and sale of power:
 - De-licensing of generation (Sec-7)
 - Development of a multi-buyer multi-seller market in power (**Restructuring of SEBs** – Sec 131)
 - Trading – licensed activity (Sec-12).
 - **Non Discriminatory open access to transmission (Sec 38-40) and Open Access in Distribution (Sec-42)**
- **Autonomous Regulatory Commission (Sec 76)** to overlook functioning of Power markets
- **Development of Power Market**
 - **Section 66** of the Electricity Act 2003 gives powers to the regulatory commissions to develop the power market including trading

Legislative Enabler for operationalization of Power Markets in India : Electricity Act 2003

- Electricity Act, 2003 – introduced Open Access

Open Access means “The non discriminatory provision for the use of transmission lines or distribution system by any licensee or consumer or a person engaged in generation in accordance with the regulations specified by the appropriate commission”

Open Access to inter-state transmission immediately allowed

National Tariff Policy- 2016

Objective

- **Facilitate adequate and uninterrupted power to all categories of consumers**
- **Availability of electricity to consumers at reasonable and competitive rates**

Also

- **Financial viability of the sector and attract investments**
- **Promote competition, efficiency in operations and improvement in quality of supply**

Other objectives

- Promotion of RE sources of generation
- **Promote Hydro Projects to provide adequate peaking reserves, reliable grid operation and integration of variable renewable energy sources**
- Evolve dynamic & robust electricity infrastructure for better consumer services
- Creation of adequate capacity including reserves in generation, transmission and distribution in advance, for reliability of supply of electricity to consumers
- Transparency, consistency and predictability in regulatory approaches

Distribution

New provisions (8)

SERCs to prepare road-map for 24-hour supply by '22.

Lower Prices due to competition

- Discoms have flexibility of charging lower than approved tariffs if competitive conditions require so without having a claim on additional revenue requirement on this account in accordance with Section 62 of the Act.

Distribution

Performance Standards (8)

Objectives

- Supply of reliable and quality power of specified standards in an efficient manner and at reasonable rates

Performance Standards

- SERC to determine standards of performance with respect to **quality, continuity and reliability** of service for all consumers.
- Penalties may be imposed on licensees in accordance with section 57 of the Act for failure to meet the standards.

Are we compliant with the policy?

Distribution

Merit Order Dispatch provisions (8)

Merit order Dispatch purchases are allowed

- All power purchase costs need to be considered legitimate unless it is established that the MoD principle has been violated or power has been purchased at unreasonable rates.

Distribution

Power Procurement by Discoms (6)

- All future procurement thru competitive bidding as per CG guidelines
- All LT and MT PPAs two-part for Merit Order Despatch
- **24-Hour notice for unrequisioned capacity for allowing Gen to sell**
- Benefits over VC to be shared 50:50, if not already provided in the PPA.
- **Change of Law** allowed to be pass-through

Renewable Energy (6.4)

- MoP to specify Long-term trajectory of RPO in consultation with MNRE
- SERCs to specify Solar RPO – reaches 8% by Mar 22 (excluding Hydro) or as notified by CG
- Discoms to compulsorily procure Waste-to-Energy in State proportionately

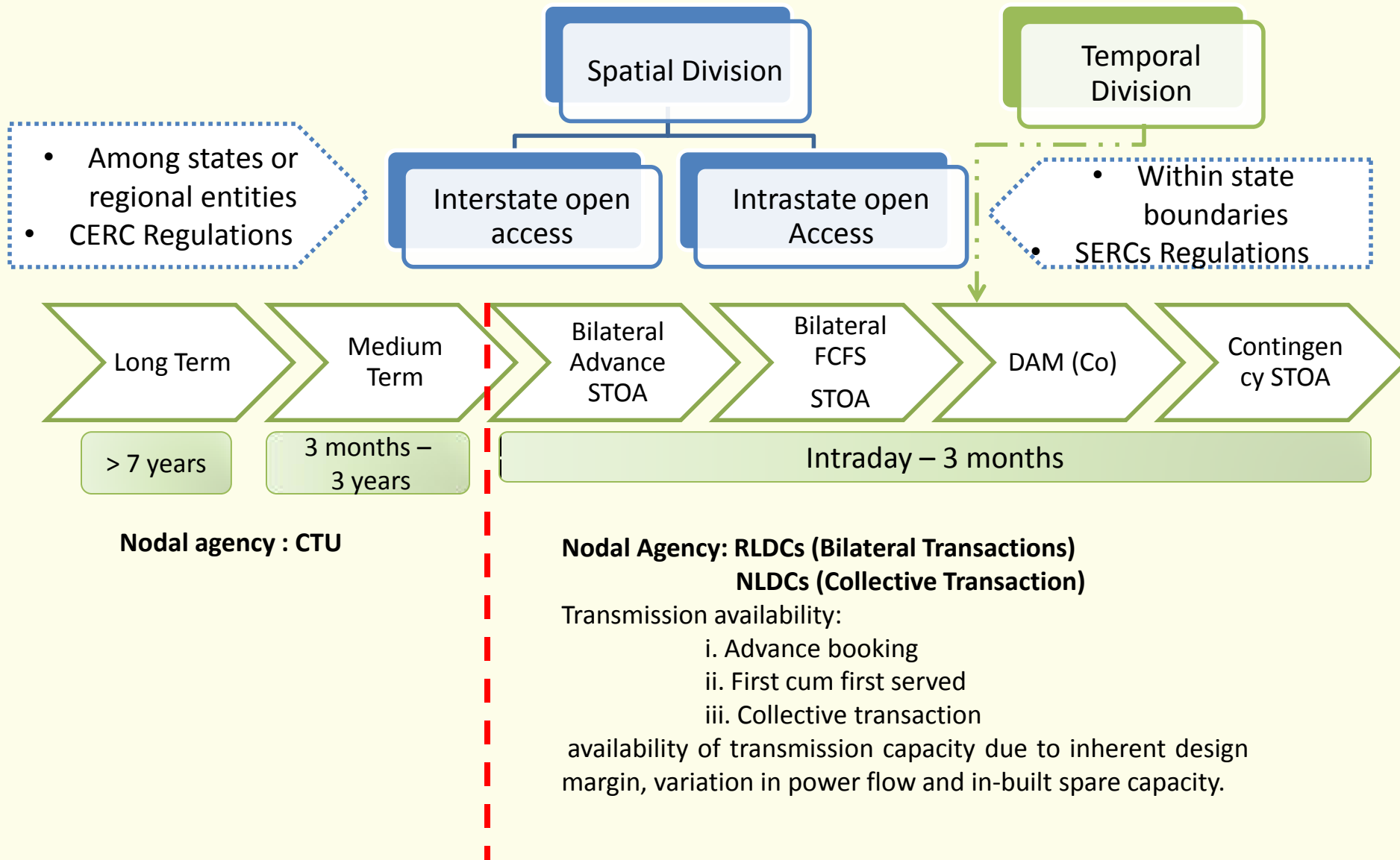
Co-gen Clarified

- Co-generation from fossil-fuel will not be entitled as RE

REC Mechanism

- Promote **REC mechanism** for transfer of RE power from RE rich States to others.
- Use REC multiplier for **technology**” and **vintage**”

Open Access Segregation



Inter-State Open Access Regulatory Framework

CERC (Open Access Regulations) 2008
Last Amendment: 2015

- Specifies roles of different agencies system operators, CTU & Transmission licensees and others
- Specifies Timelines
- Provide for congestion management- Setting relative priorities
- Separate procedures for 'Day-Ahead Market (collective transactions) and OTC transactions on inherent margins

CERC (Grant of connectivity, Long Term Access and Medium Term Open Access) in inter state transmission Regulation, 2009

- Nodal agency for grant of Long and Medium access: **CTU**
- Defines criteria for grant of access and application procedure for medium and long term access

Procedure for Scheduling STOA in Interstate Transmission (Collective Transaction)
(Bilateral Transaction)

- **Collective Transaction:** Application procedure, treatment of losses, congestion management at PXs
- **Bilateral Transaction:**
 - Procedure for Advance Scheduling/FCFS/Day-Ahead Bilateral/Contingency Transaction

Open Access in Inter-State Transmission

- Regulation Implemented w.e.f. 6-May-2004, revised Regulations w.e.f 1st April 2008 and amended in May 2009. Last amended in 2015
- **Transmission Capacity Reservation Categories**
 - Monthly bilateral
 - Advance /FCFS
 - Day ahead bilateral
 - Collective Transactions through Power Exchange
 - Intra day bilateral
- **Nodal Agency**
 - Bilateral : RLDCs & Collective : NLDC
- **Transmission Charges moved from “Contract Path” to “Point of Connection” for Collective/Bilateral**
- **Other Commercial Issues**
 - Handing deviations from schedule
 - Handing reactive energy supply/drawl
 - Payment security
 - Collection and disbursement of charges

Inter-State Open Access – basic framework

Nature of Contract

Long Term

Medium Term

Short Term

Power Exchange

Tariff Structure

Two Part Tariff

Either Two part or
Single Tariff

Single Tariff

Single Tariff

Nodal Agency

POWERGRID for **Inter state**
& STUs for **Intra State**

Buyer RLDC for **Inter State** &
SLDCs for **Intra State**

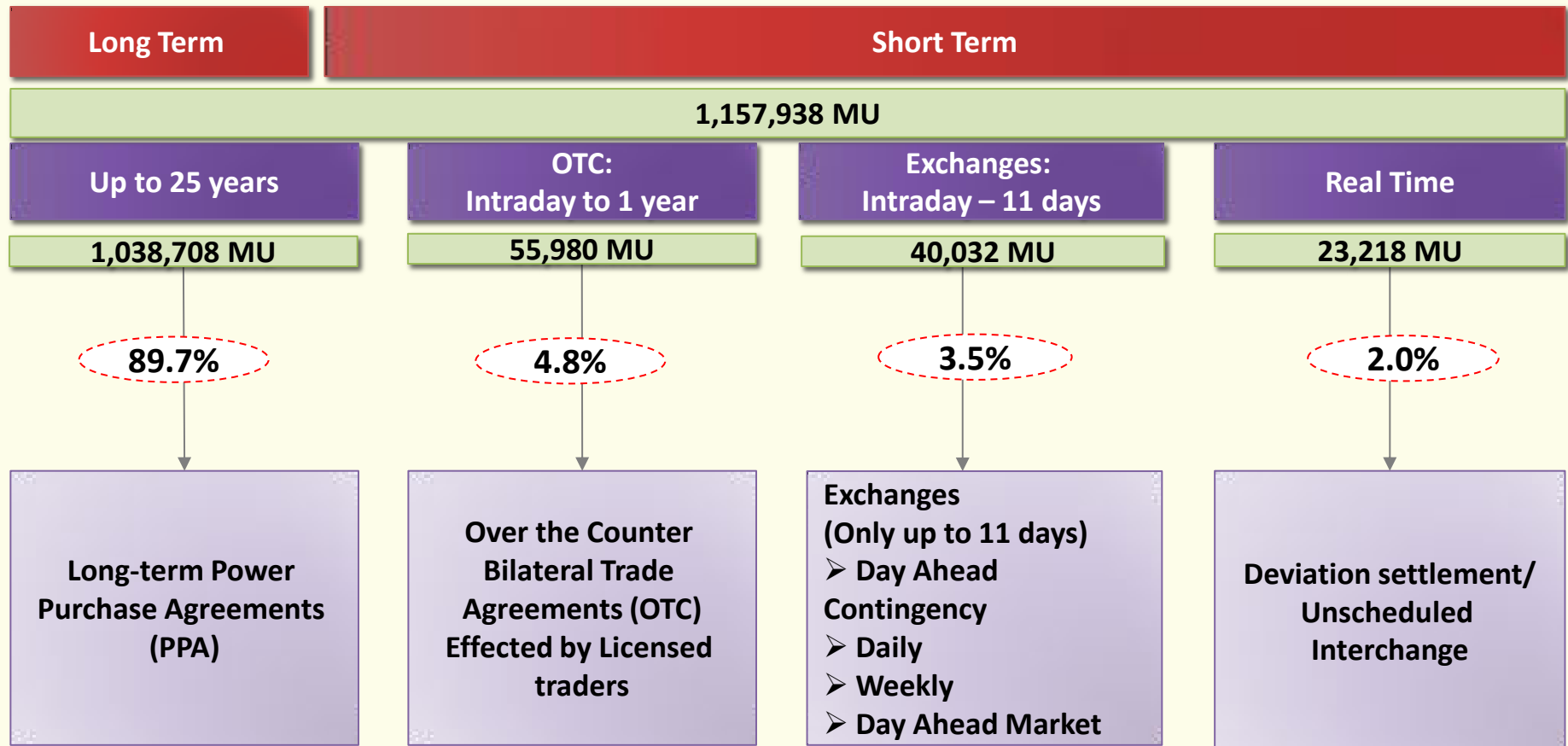
NLDC for “**Day Ahead Market**” &
RLDCs for “**Term Ahead Market**”

Criteria for allowing access

- Long-Term Access: based on transmission planning criteria stipulated in the Indian Electricity Grid Code.
- Medium & Short Term Access: subject to availability of transmission capacity due to inherent design margin, margin available due to variation in power flow and margin available due to in-built spare capacity.
- Allotment priority of long term customers higher than that of Medium term & Short term customers.

STRUCTURE & STATUS OF SHORT TERM POWER MARKET

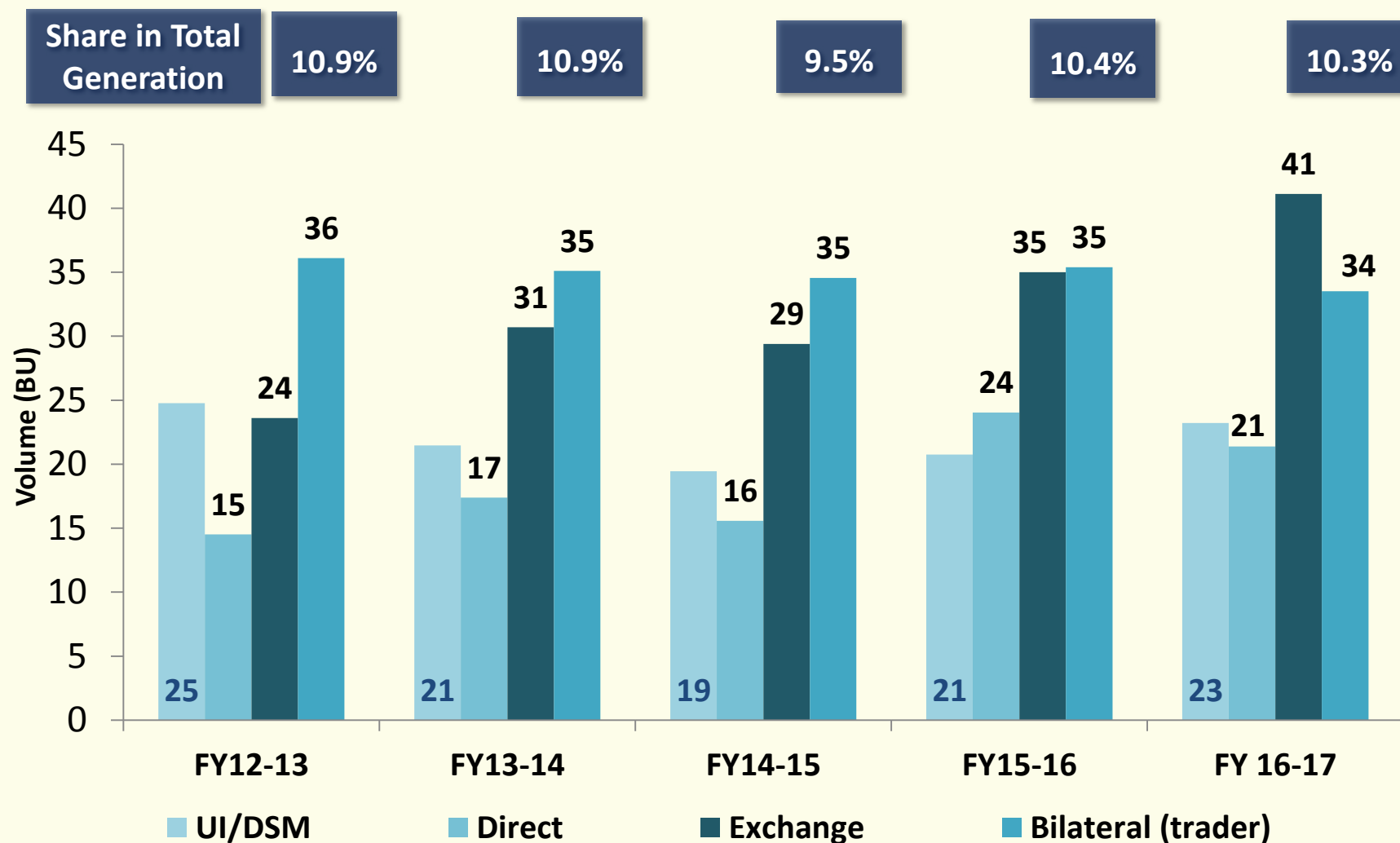
India Power Sector | Present Market Segments



Short Term Power market is at ~10%, Power Exchange volume in the segment have been growing significantly

Source: CERC MMC Report

Share of Short Term Market in Total Generation



- Short term market grew at a rate with a **CAGR of 9%** (FY-10 to FY 17).
- Power Exchanges witnessed growth at a **CAGR of 28%** (FY-10 to FY 17).

Source: CERC MMC Reports

SHORT TERM MARKET PRACTICES

Discom's Options For Power Procurement

Long-term

- 25-year PPA - Tariff on cost-plus or competitive bid

Medium Term

- 3 Month- 3 Years
- Tariff covers : Fixed Cost + Variable Cost+ Mark Up (< long term)

Short Term (OTC)

- Intraday- 3 Months to be procured through competitive bidding only
- Single tariff covering Tariff covers Fixed Cost+

Day-Ahead Market

- Highly liquid and transparent marketplace
- More accurate load management

Intra-day

- Last-minute adjustments (Gate closure 4 hours)
- Less liquid

IEX Market Segments

Day-Ahead Market

since June,08

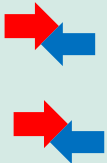
- *Delivery for next day*
- *Price discovery: Closed , Double-sided Auction*



Intraday Market & Day-Ahead Contingency

Round the clock since Jul'15

- *Intraday: For Delivery within the same day*
- *Day Ahead Contingency: Another window for next day*
- *Gate closure : 3 hours*



Term-Ahead Contracts

since Sep'09

- *For delivery up to 11 days*
- *Daily Contracts, Weekly Contracts*



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***



Energy Saving Certificates

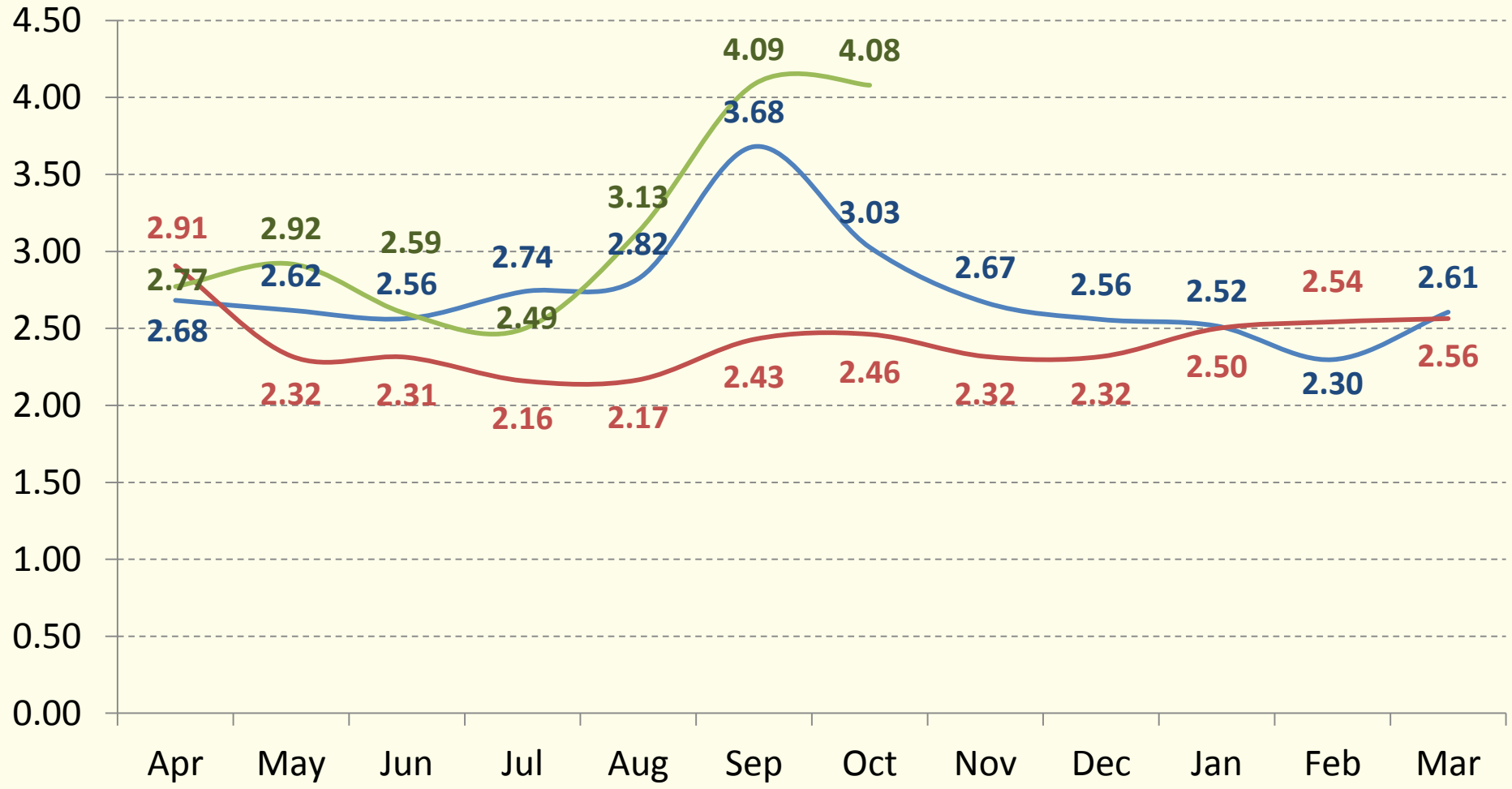
since 27th Sept'17

- ***1 ESCert = 1 mtoe (metric Tonne of Oil Equivalent)***
- ***Trading Session on every Tuesday of the Week***
- ***Trading time 1300 hrs to 1500 hrs***



Monthly Average Market Clearing Price (Rs/kWh)

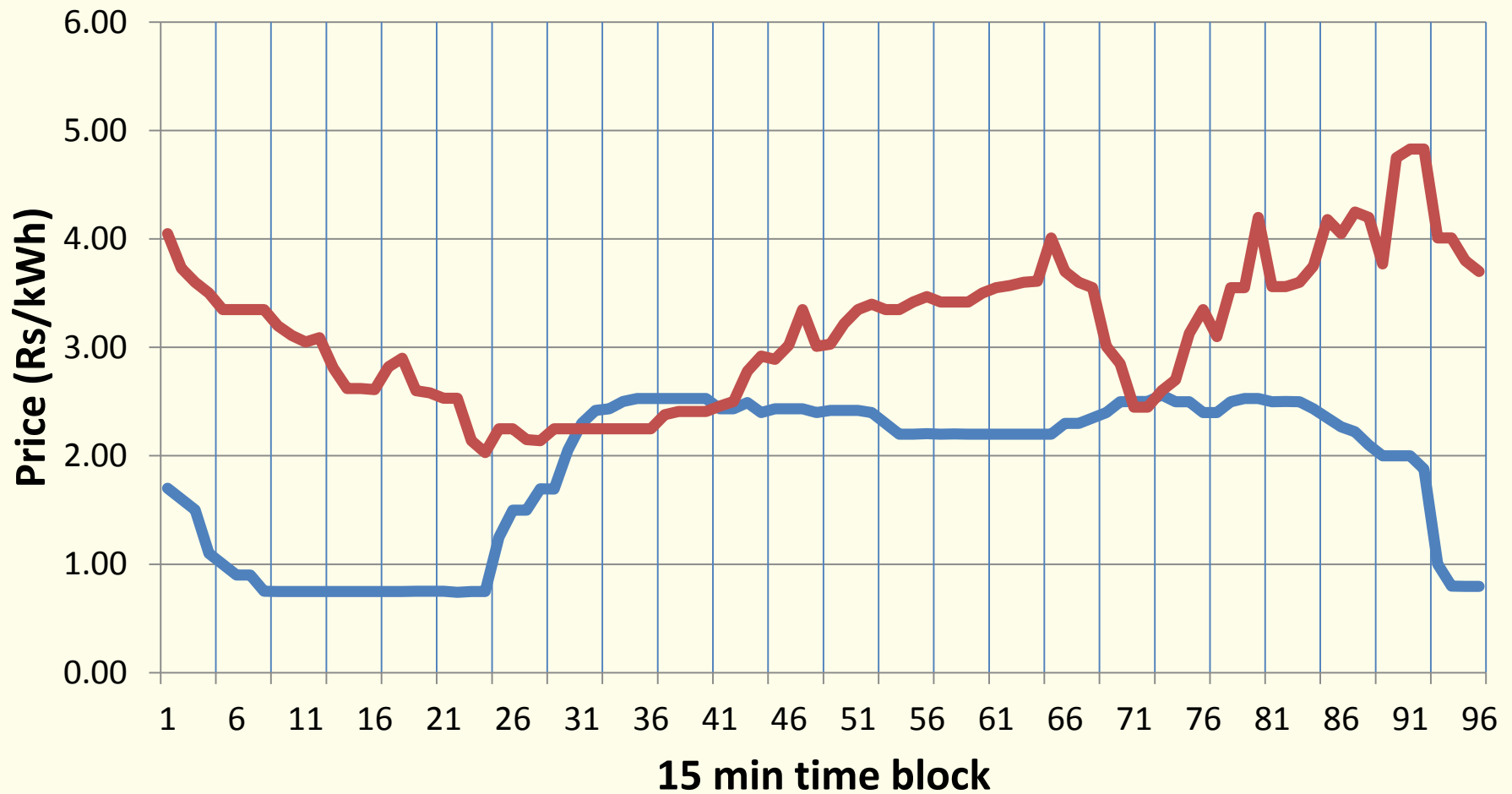
Avg. MCP FY15-16: Rs 2.73/kWh
Avg. MCP FY16-17: Rs 2.42/kWh
Avg. MCP FY17-18: Rs 3.00/kWh



Data as on 30th Sept 2017

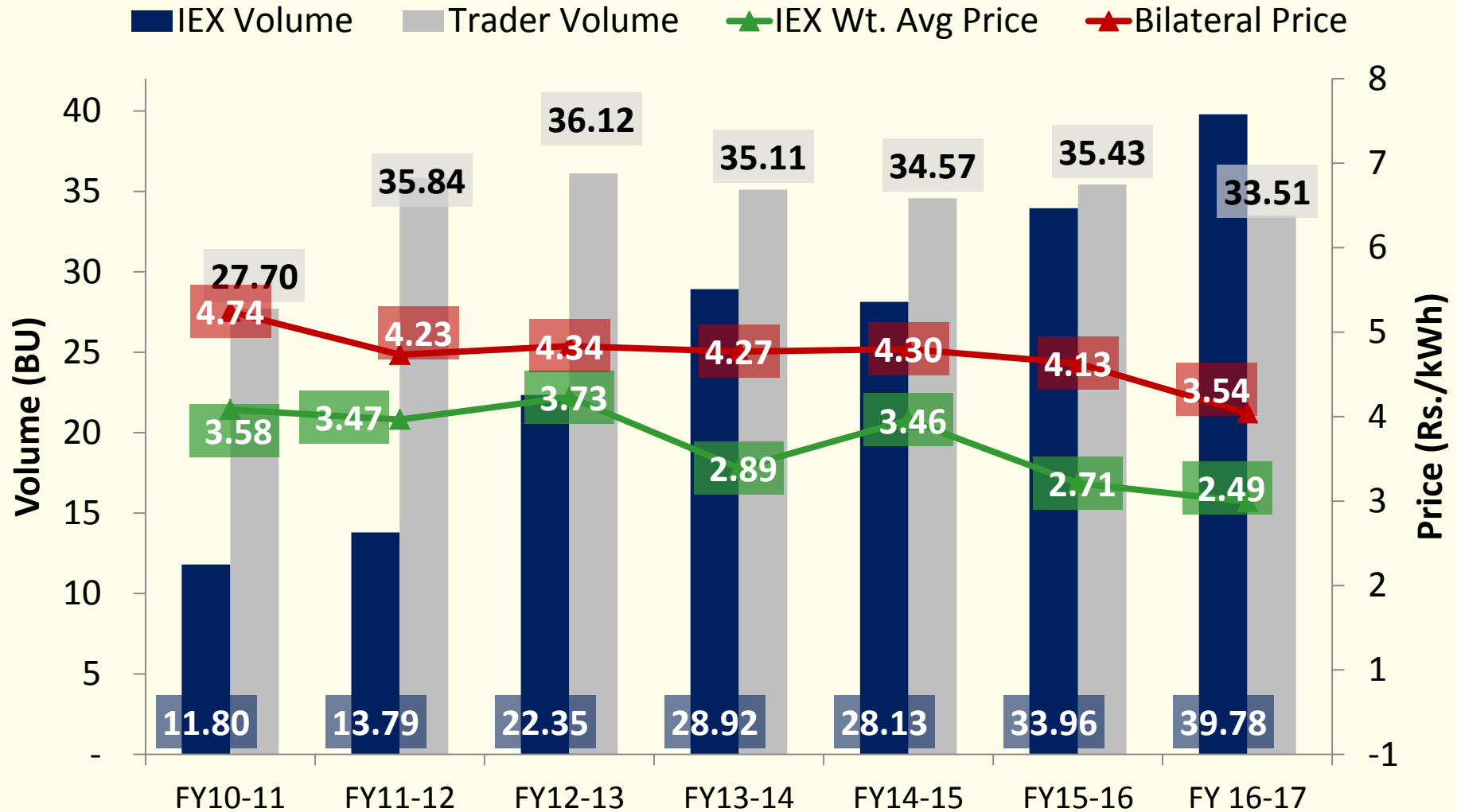
Price Comparison of a typical day

— Winter — Summer



Winter: 18/12/2016 | Summer: 15/04/2017

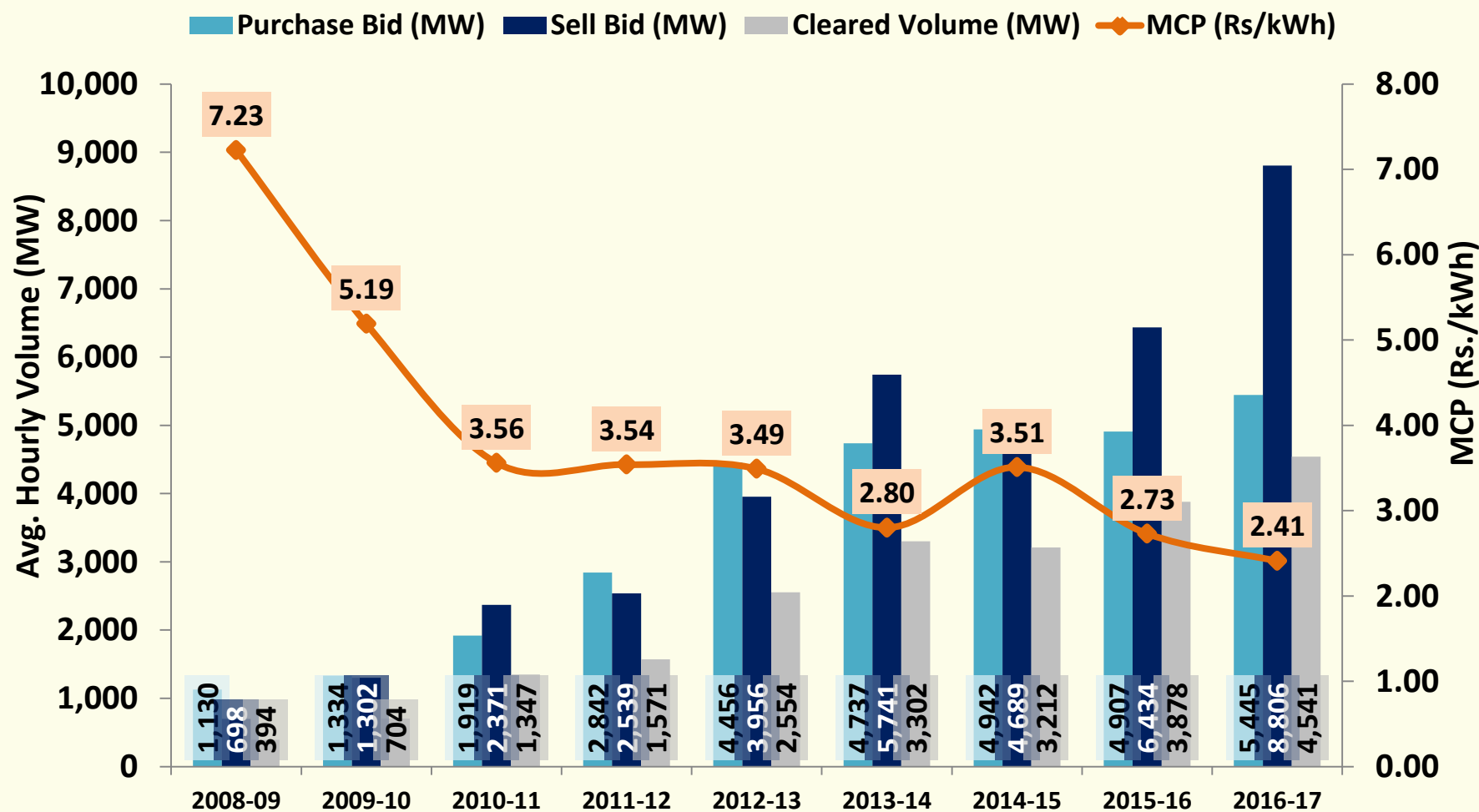
Price and Volume: Bilateral vs. IEX DAM



Prices at the Exchange always remained lower than Bilateral Contracts

High Liquidity in Volume at IEX

(Avg. Hourly Volume in MW)



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

- 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

Installed Capacity & Generation (FY 2016-17)

Category	Installed Capacity (MW)	PLF	Generation (BUs)	Feasible PLF	Possible Generation (BUs)
Coal	192,163	60%	944	80%	1,347
Gas	25,329	22%	49	80%	178
Diesel	837	3.5%	0.26	5%	0.4
Hydro	44,478	33%	122	33%	129
Nuclear	6,780	74%	38	80%	48
RE	57,260	16%	81	18%	90
Total	326,848		1,236		1,791

- Present installed capacity is enough to meet the demand of next 5 years at a growth rate of 6%
- Further capacity addition of 70,000 MW of conventional power and more than 1,00,000 MW of Renewable power expected during 13th Plan

Commercial
decision-making

'SMART' Options with Distribution Companies

**SMART
CONTRACTING**

Ensuring ideal mix of long term and short term power purchase arrangements to manage fixed cost and manage availability of supply

**SMART
PROCUREMENT**

On a day to day basis- managing demand of the area by utilizing cheaper short term sources by replacing power from high variable cost plants and ensuring MERIT order based dispatch

1. SMART Procurement

- **Under long term & medium term PPA : two part tariff**
 - **Capacity charges (commitment charges):** paid irrespective of whether discom purchase power from these plants or not
 - **Energy charges :** Paid corresponding to the number of units of power purchased from that particular plant
- **Discoms can replace costlier long term power by procurement from IEX, if,**
 - Energy charge of power plant is greater than IEX rates
 - During night hours prices at IEX are further low and savings can be enhanced
- **Discoms can replace ISGS first, keeping import constraint in consideration**
- **Discoms can continue paying fixed charge to Long Term PPAs and substitute where energy charge is higher than IEX price**

Merit order dispatch schedule to be prepared based on

Variable cost and considering Exchange Prices

Capacity Tied up by Discom

Long Term
Contracts

PPA | Variable
Cost

PPA 1 | 3.70

PPA 2 | 4.06

PPA 3 | 3.00

PPA 4 | 1.99

PPA 5 | 2.00

Bilateral
Contracts

Contract 1 | 4.70

Contract 2 | 3.50

Contract 3 | 2.10

Exchange

IEX Price | 2.45

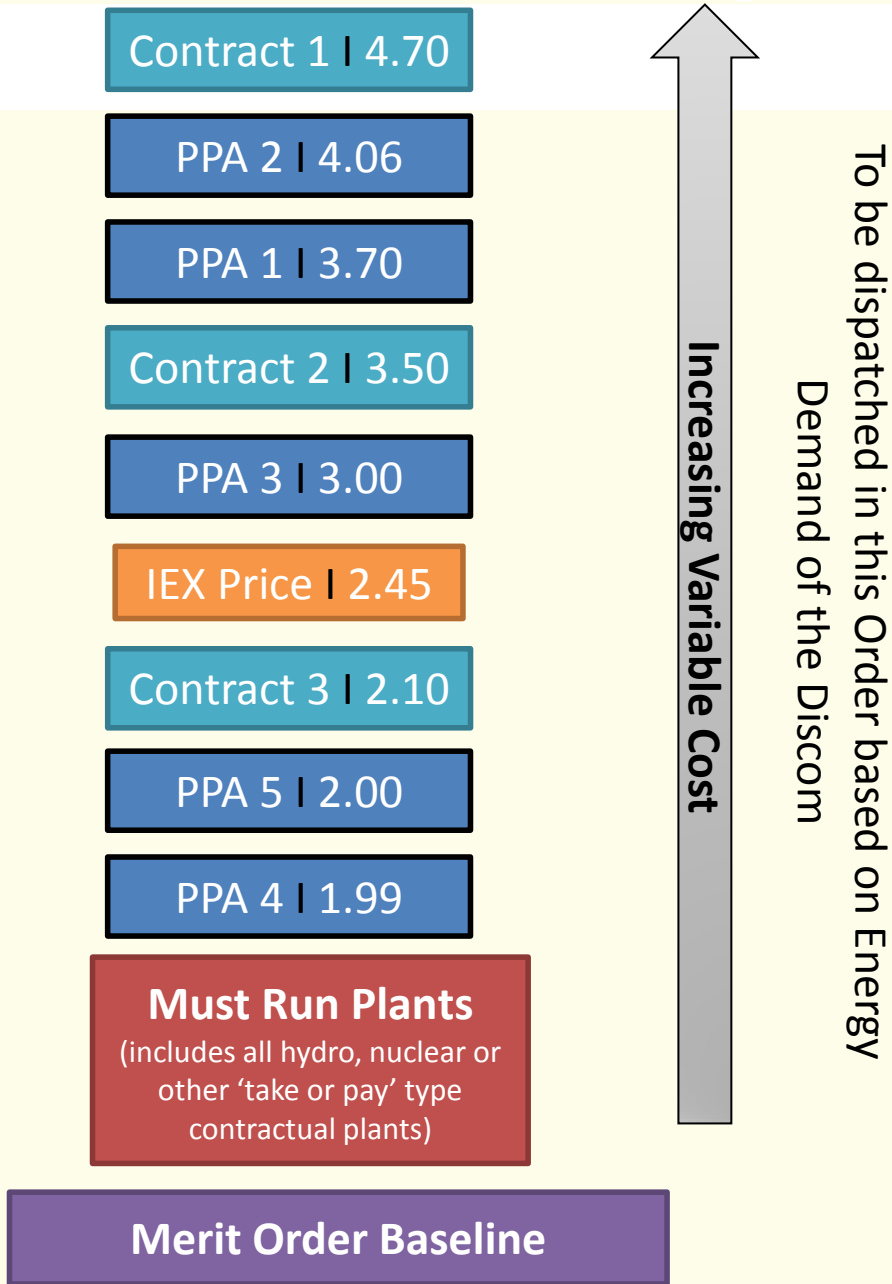
Must Run Plants

(includes all hydro, nuclear or other 'take or pay' type contractual plants)

Merit Order Baseline

Merit order dispatch schedule to be prepared based on

Variable cost and considering Exchange Prices



SMART Procurement

Smart Buy

Optimization /Replacement Bid

Avl Gen in MW

Gen 1 : 100

Gen 2 :80

Gen 3: 120

Possible Backdown /Surrender (MW)

20

5

25

Variable cost

Rs 1/unit

Rs 3/unit

Rs 4/unit

Replacement cost/ Exchange Bid

Rs 0.5/unit

Rs 2.5 /unit

Rs 3.5/unit

Exchange Price

Rs 2.1/unit

✗

✓ 5MW

✓ 25 MW

Rs 2.6/unit

✗

✗

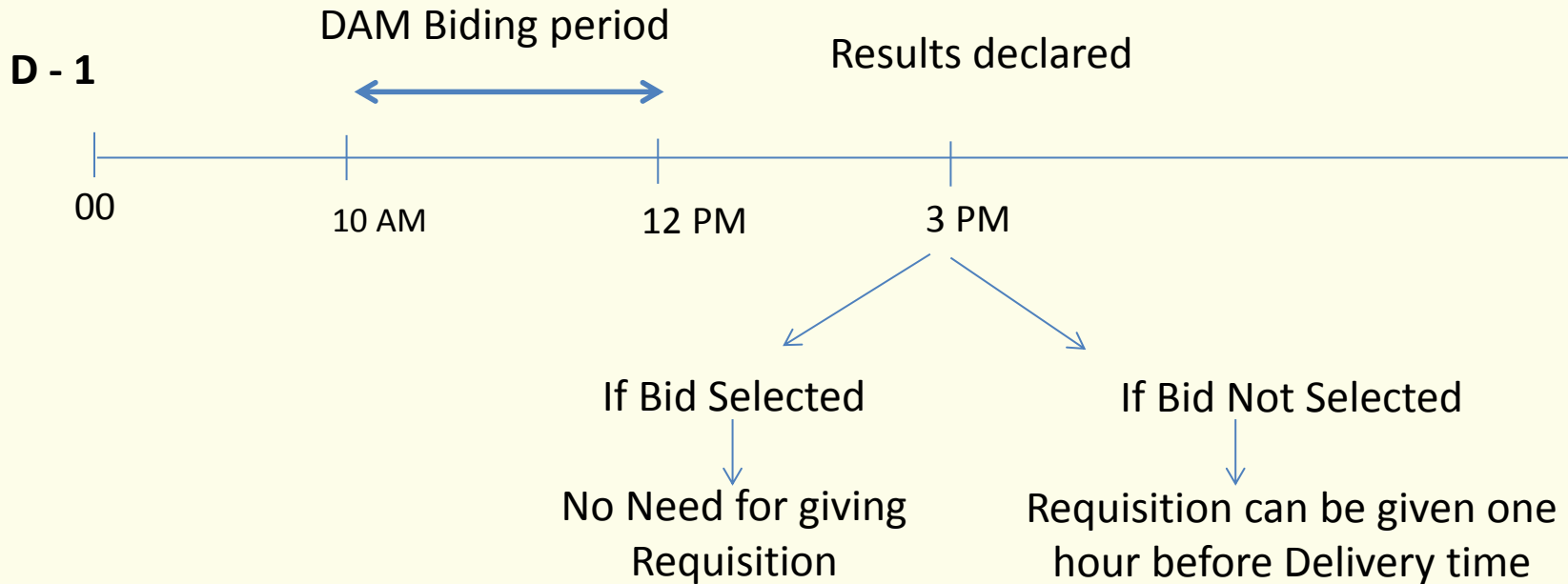
✓ 25MW

SMART Procurement

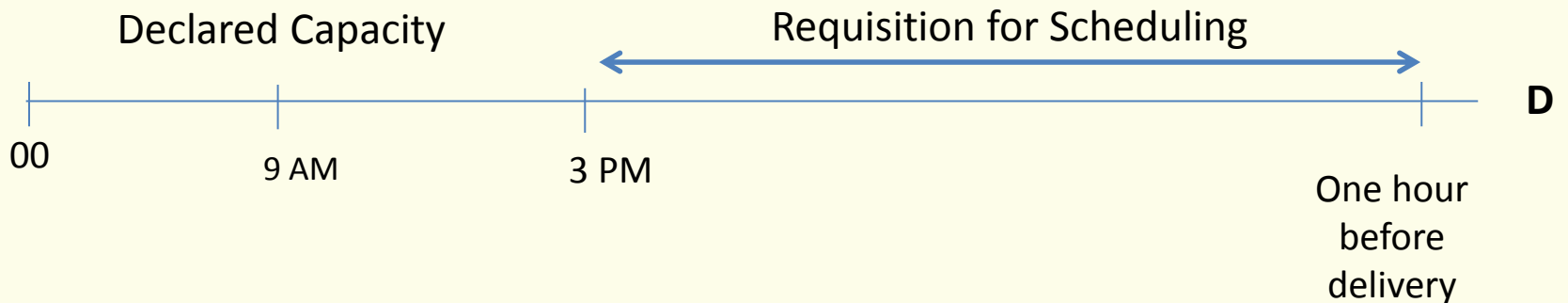
- **Assess Generation availability and Demand Forecast for next day (15 min block)**
 - Generation data for Long Term (LT) | Medium Term (MT) | Short Term (ST)
 - Calculate Surplus and Shortage to prepare “**Regular Bid**”
- **Prepare schedule with maximum back down possible for LT & MT**
 - For every plant identify maximum back down possible considering all constraints
 - Technical | Must Run status | Contractual | Transmission (Intra / Inter-state)
 - Give technical minimum schedule to these plants and identify “**Replacement Bid**” quantum
- **Submit Bid at Exchange (1000 Hrs-1200 hrs)**
 - **Regular Bid:** For Regular Shortage/Surplus depending on the demand and Generation cost
 - **Replacement Bid:** Price sensitive bids (based on Variable cost) for every plant
 - Two Bid Options
 - Single Bid: For every 15 min time block separately. May lead to non uniform back down schedule
 - Block Bid: All or none principle for clubbed time blocks. Will ensure uniform back down schedule
- **Post IEX result- finalize schedule (after 1500 Hrs)**
 - **If Replacement bid not selected:** Revise the schedule from the plants whose bid is not selected
 - **If Replacement bid selected:** No change and retain the earlier schedule (max possible back down)

Timeline for Bidding and Backdown

IEX Bidding



ISGS Scheduling



Merit Order

Power Plant	Variable Cost (Rs/kWh)	IEX Price (Rs/kWh)
KAWAS LF/RF	7.46/4.51	RTC: Rs 2.23/kWh (July'17)
GANDHAR LF	4.49	
MAUDA (MSTPS-II)	3.00	
MAUDA (MSTPS-IV)	2.87	
NTPC RSTPS 1&2	2.42	
KAWAS NAPM/APM	2.05/1.83	
GANDHAR NAPM/APM	2.04/1.77	
VSTPS-STG-I	1.51	
VSTPS-STG-II	1.42	
VSTPS-V	1.42	
VSTPS-STG-III	1.41	
VSTPS-STG-IV	1.41	
SIPAT-II	1.37	
SIPAT I	1.33	
KSTPS	1.30	

Source: www.vidyutmode.in

*Landed price including POC loss and POC charges as below
POC Loss: 2.52% & POC Charges : Rs 0.27/kWh

CASE STUDY: Cost Optimization by Bihar

- Bihar has initiated the process of Cost Optimization
- The costlier power from Barh & Dadri stations is replaced by the cheaper power from IEX.
- The Energy Charges of these power plants are greater than the IEX rates.
- **Bihar has made a saving of over 11 crores in 21 days**

Due to low prices at the Exchange there was further potential to increase savings

Bihar Savings

Delivery Day	Savings (in Rs. Lacs)	Further Savings (in Rs. Lacs)	Total
6th June'15	19	83	102
7th June'15	55	38	93
8th June'15	51	17	68
9th June'15	31	43	74
10th June'15	37	27	64
11th June'15	60	9	69
12th June'15	46	15	61
13th June'15	75	30	105
14th June'15	12	80	92
15th June'15	18	70	88
16th June'15	31	53	83
17th June'15	181	0	181
18th June'15	71	20	92
19th June'15	102	0	102
20th June'15	103	8	111
21st June'15	78	30	108
22nd June'15	29	67	96
TOTAL	997	487	1,274

*A min of 200 MW power purchase is considered in each block with replacement of Dadri & Barh power

Key factors considered for Smart Power Procurement

- Demand Forecast - Forecast on 15 min time block basis
- Generation Data
 - Plant wise DC /Entitlement of various ISGS and SGS on Day ahead basis
 - Variable cost of all generators (ISGS,SGS, Bilateral etc)
 - Applicable losses and charges Import/Export (banking etc)
 - Generator outage period
- Optimization potential assessment
 - Must run plants
 - Back down potential in each plant considering
 - Technical minimum
 - Contractual minimum
 - Network constraints
 - Ramp-up/Ramp down

Smart Procurement : Saving Potential

**Rs. 3200 crore from
Smart Procurement**

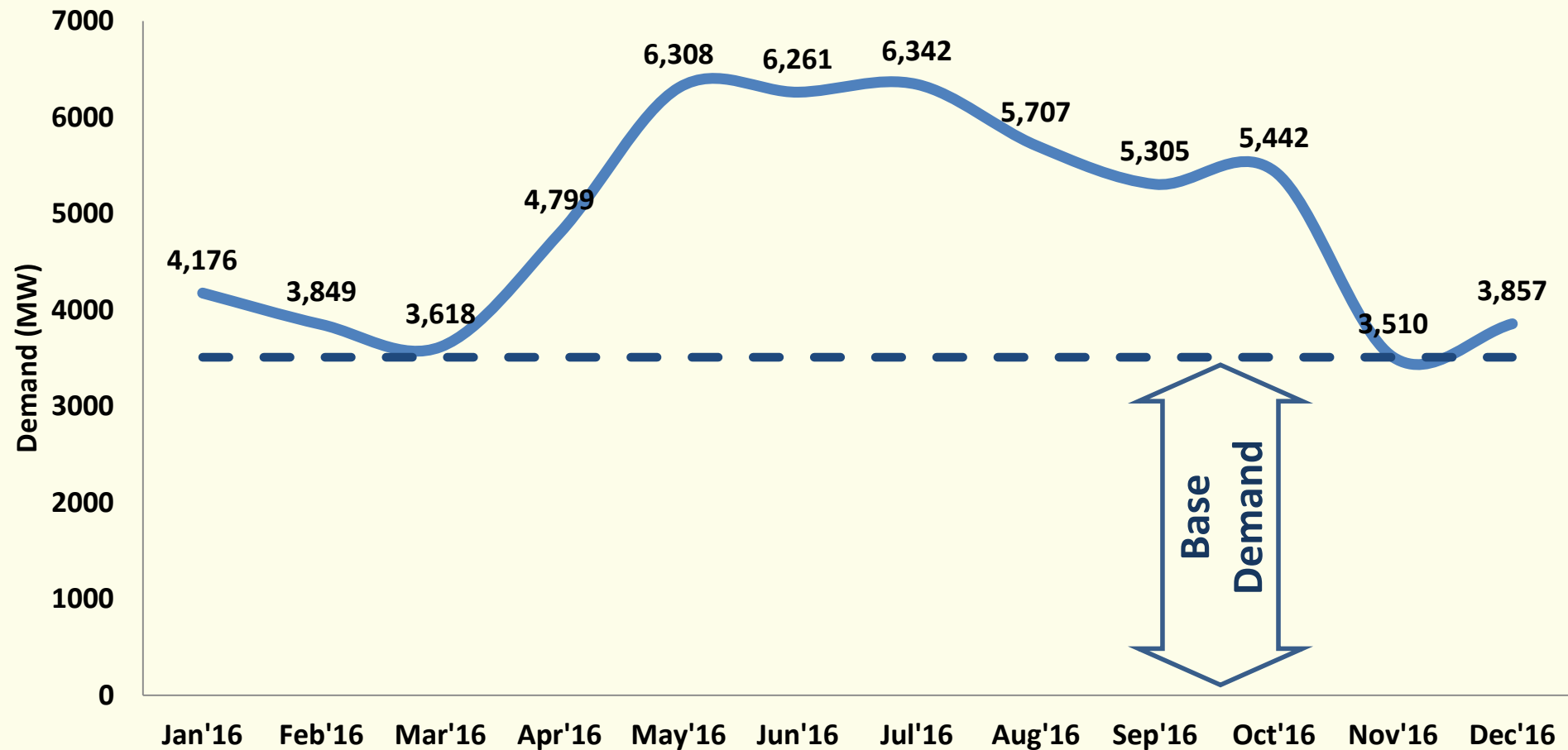
State	DISCOM losses (in INR cr, FY17E)	Smart Procurement savings (in INR cr, FY17)	Average power to be bought (MW)
Uttar P	5012	800	1350
Tamil Nadu	2224	490	660
Punjab	1681	190	400
Haryana	2911	270	400
Andhra P.	1032	170	350
Telangana	4380	150	300
Maharashtr	2639	110	390
Rajasthan	2195	80	190
Bihar	2275	60	125
MP	2278	20	70
Other states**	-1955	820	1450
Total	25000	3200	5700

2. Smart Contracting

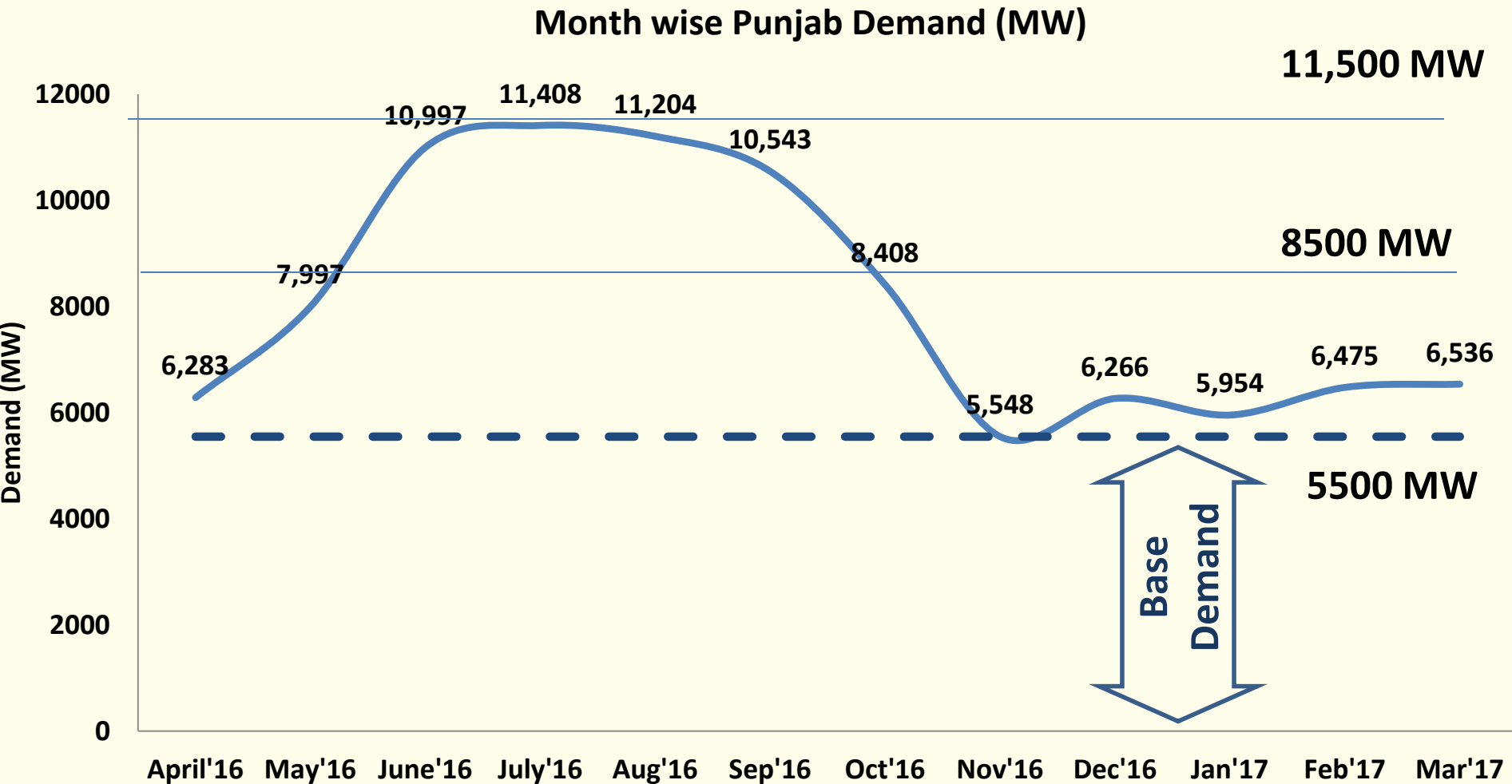
- i. Discoms should tie-up PPA only to manage their base demand
- ii. Many Discoms have tied PPAs to meet their peak demand as well. The Discoms have to pay the capacity charge for this quantum even in the off peak time.
- iii. So for optimum utilisation, Long Term PPA should be only for base demand and remaining energy (for peak and variations in forecast) should be bought through other available market options.

Monthly Demand Curve for Delhi

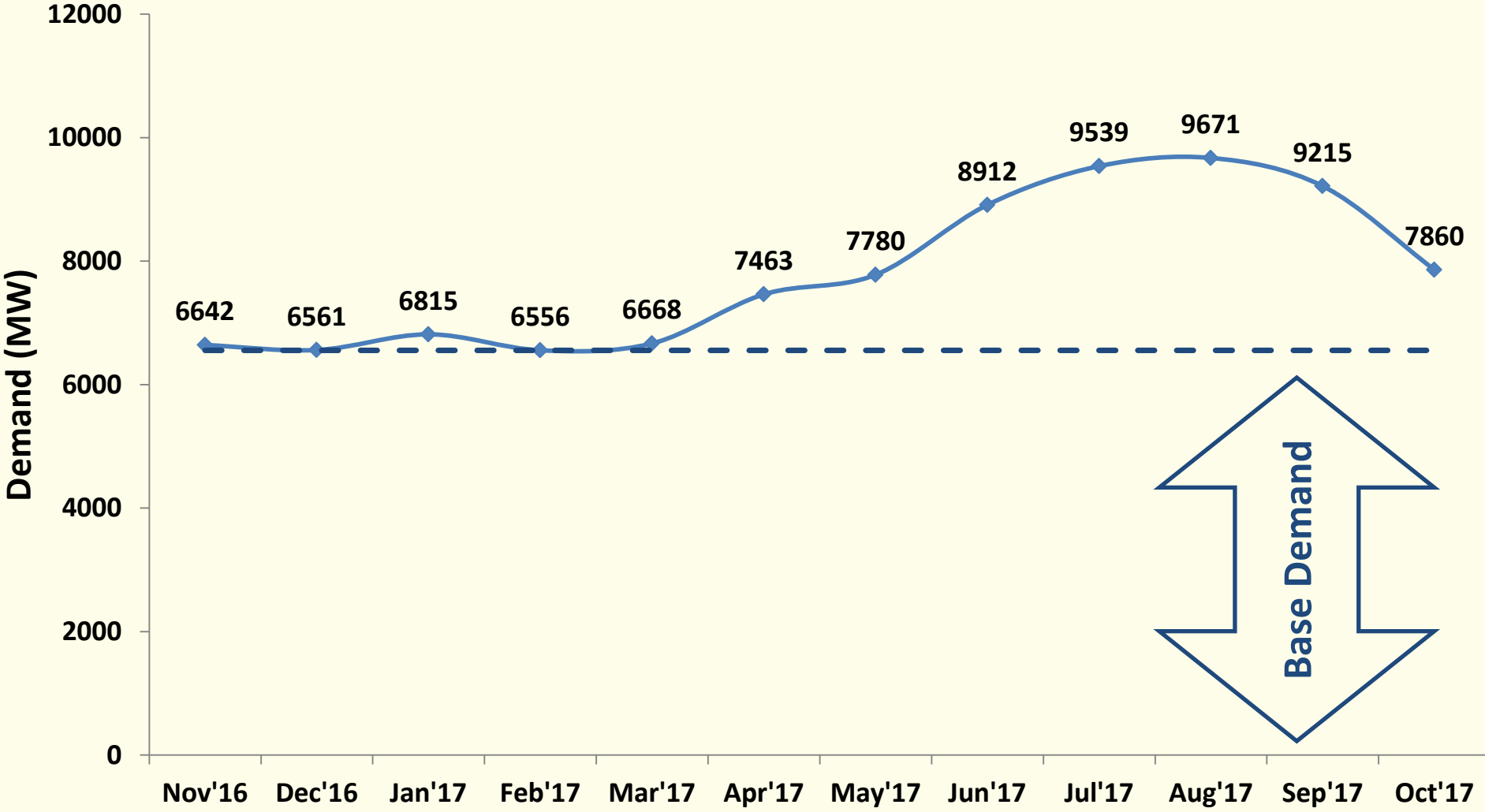
Month wise Delhi Demand (MW)



Monthly Demand Curve for Punjab



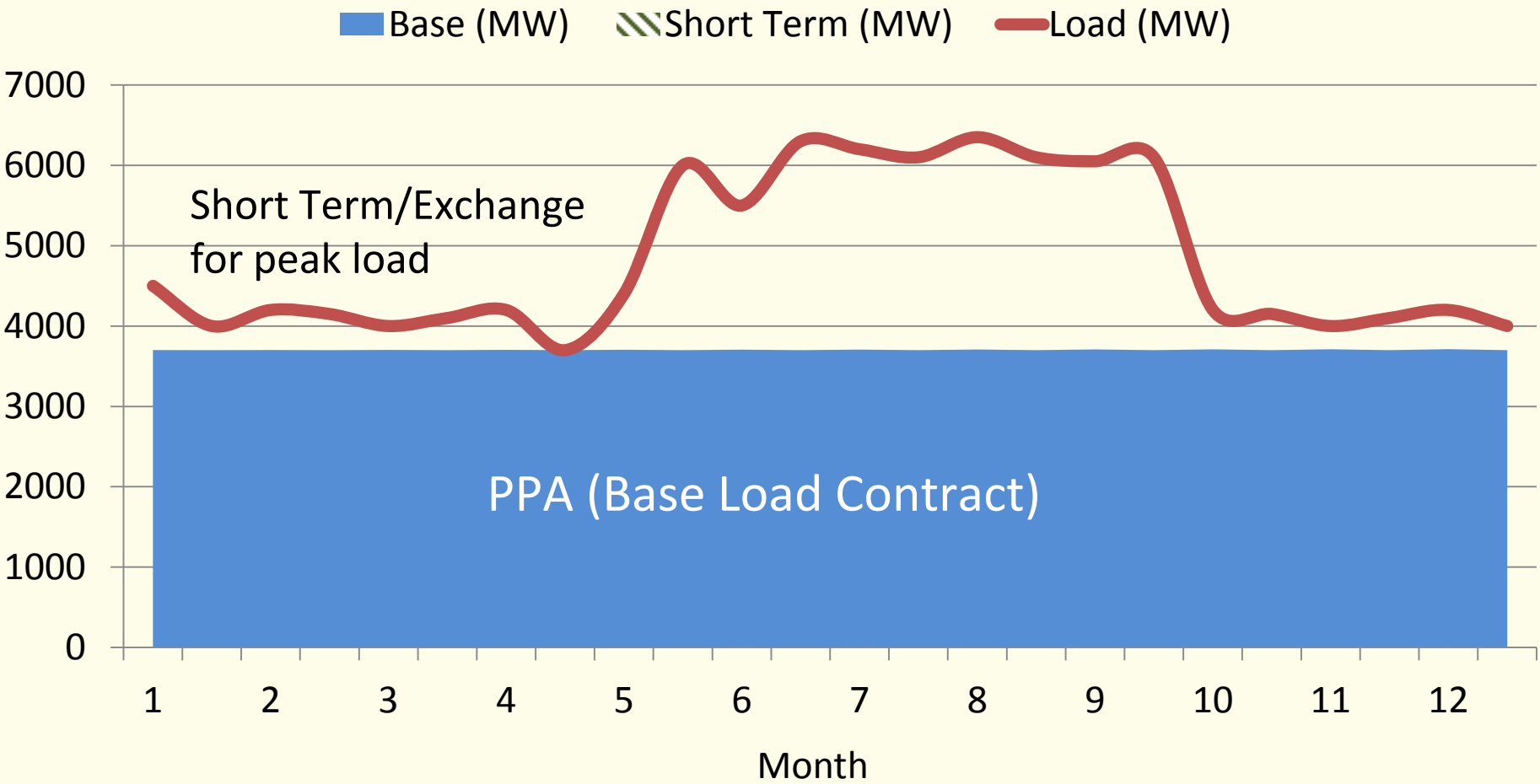
Monthly Demand Curve for Haryana



Meeting Shortages/Surplus through Short Term Market

Maximizing efficiency – Ideal Scenario (Monthly)

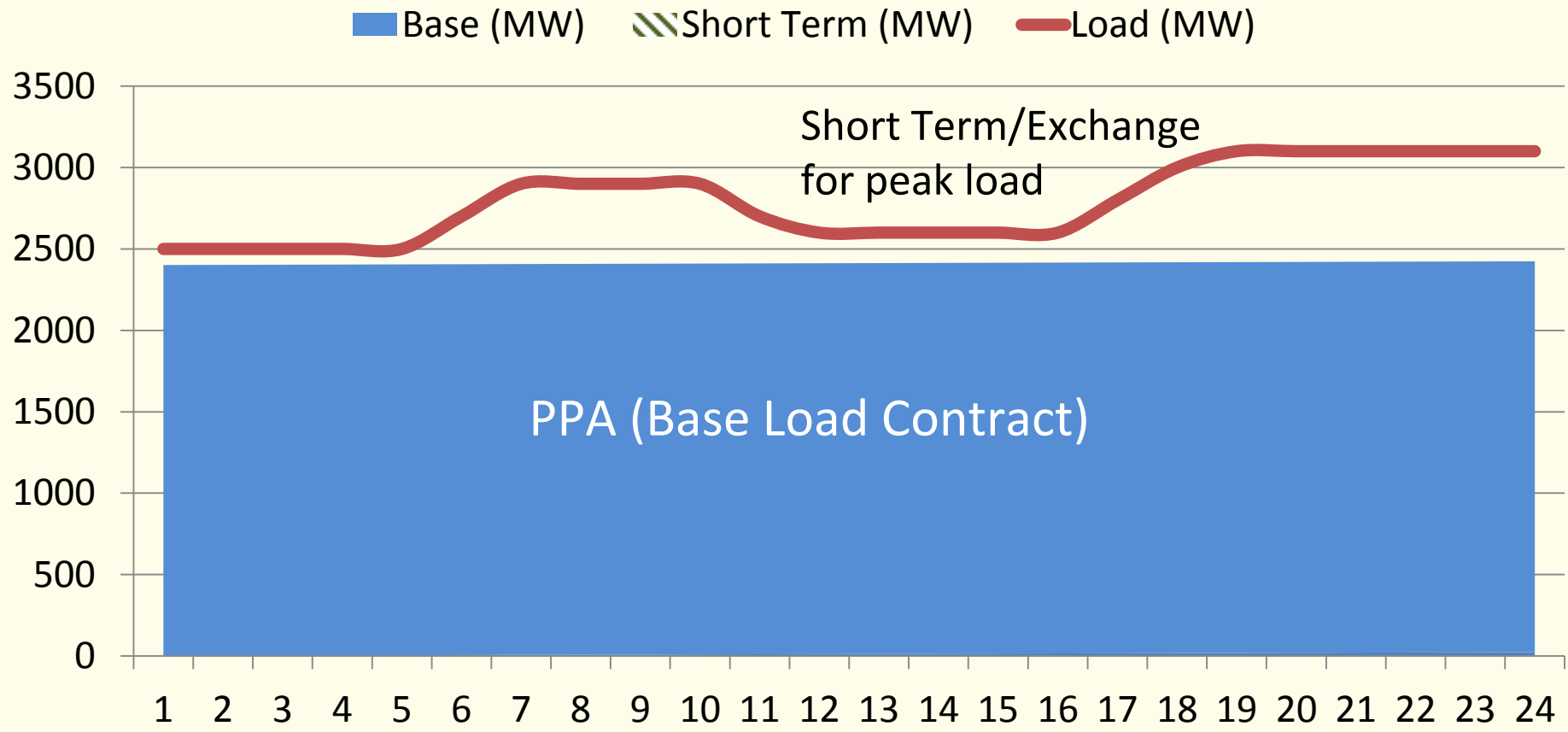
➔ **Surpluses/Deficits** - Balance physical supply and demand



Meeting Shortages/Surplus through STM

Maximizing efficiency – Ideal Scenario (Hourly)

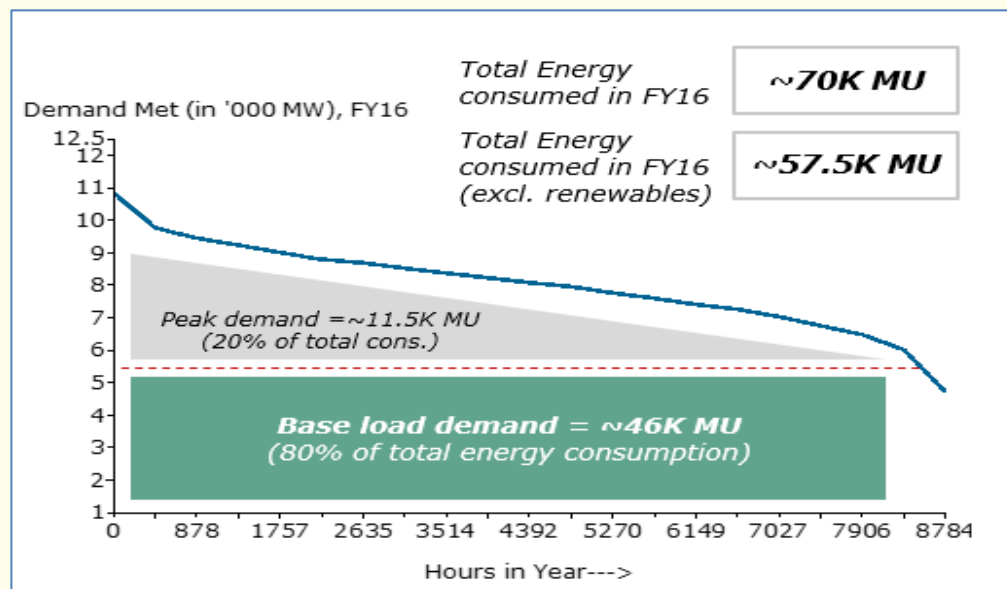
➔ **Surpluses/Deficits** - Balance physical supply and demand



Smart Contracting- Ideal mix LT

Methodology 2 -Long term PPA for 80% of total energy demand

- Draw load curve for a state (indicating demand met in MW for each hour of the year),
- Estimate the demand met in MW that corresponds to meeting 80% of total energy demand over the year
- Estimate total capacity required to meet baseload demand by applying an average Plant Load Factor (PLF) to the baseload demand met (in MW).



Key considerations – for long-term

- Demand projections for next few years (say 3)
- Extent of Renewable growth
- Solar Rooftop potential
- Hydro potential in the State

Procurement Strategy for Renewable Energy

- Purchase of bundled green power to be benchmarked with market determined prices of power & REC
- Discom can purchase Power @ 2.41 (IEX Avg. Price for FY17)
REC @ 1.00
3.41

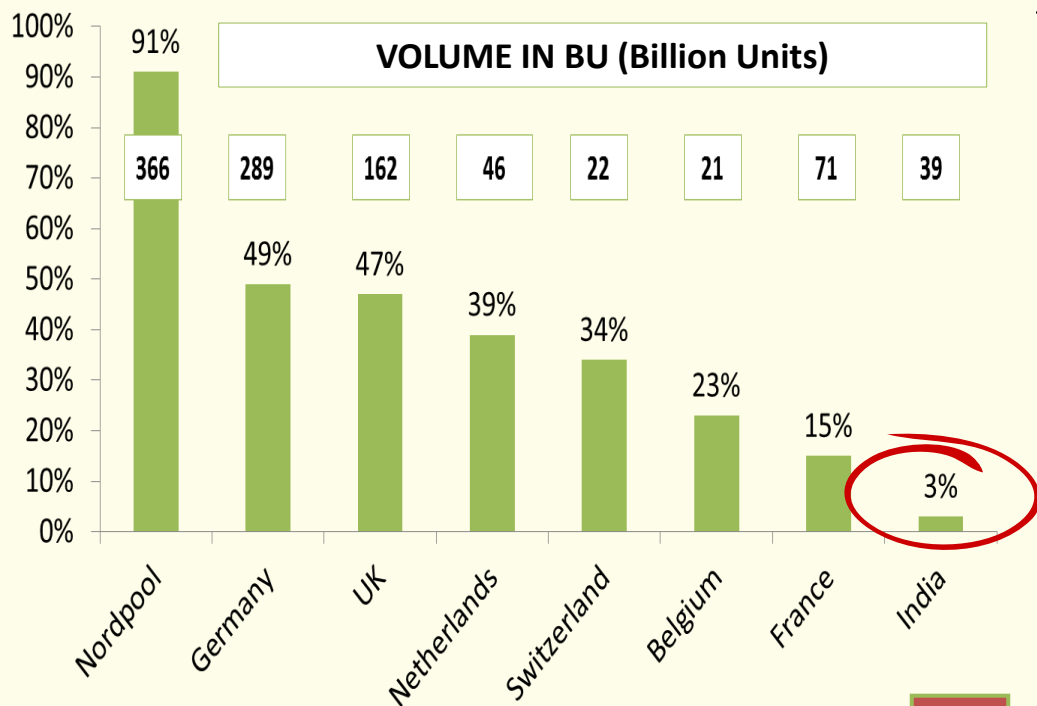
- Deficit state should procure renewable power only if the power is available at Price less than Rs 3.41/kWh.
- Flexibility in procurement as Discom can purchase power when they actually need.

Flexible Purchase at most competitive price

Power Exchange across Globe:

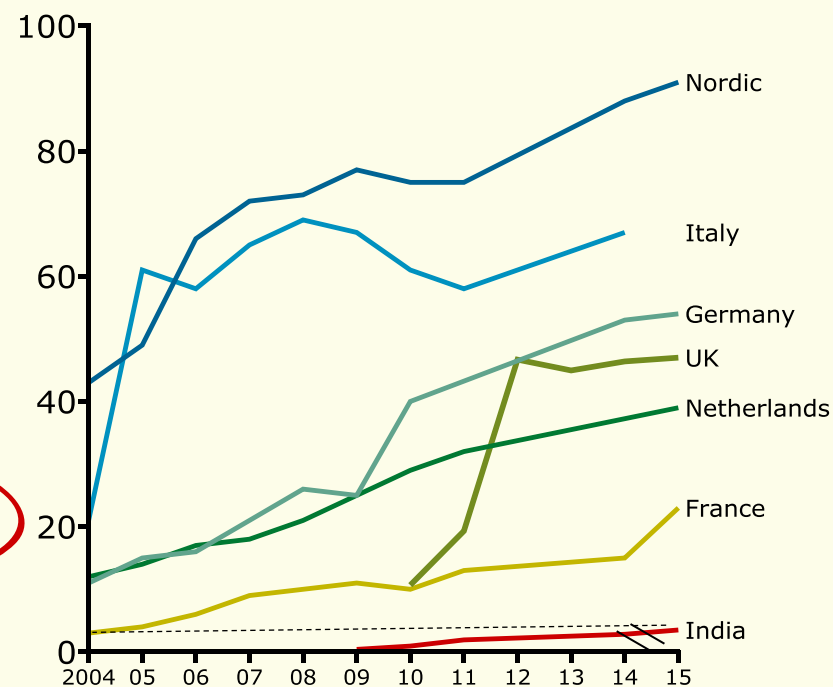
Enormous potential to grow for India compared to international benchmarks

INDIA TRADES ~3% OF ITS OVERALL CONSUMPTION ON EXCHANGE
MARKETS COMPARED TO 15-91% GLOBALLY



GLOBAL BENCHMARKS ON PENETRATION OF ST MARKETS

Exchange traded (% total consumption)



Indian markets still at a nascent stage and high potential for growth for the Indian Power Exchanges

Suggestions for development of Power Market in India

Policy push for promoting short term market

- Prices discovered on Short term market, particularly Exchanges is very competitive, therefore government should also take policy initiatives to develop short term market
- It will also help Discoms to manage power demand efficiently and at competitive rates

Long term PPAs by Discoms should be limited to 10-12 years

- Discoms in past contracted long term power on the basis of peak demand, as a result, many of the states landed up having surplus capacity during 6-7 months in a year, paying capacity charge without utilizing the power.
- PPAs should not be more than 10-12 years to give comfort to the bankers.
- PPAs which expire after 25 year period should not be renewed and be allowed to sell power in market for market development

Power Purchase cost optimisation by Discoms

- **Follow merit order dispatch**
 - Discom to ensure that the principle of economic dispatch/ merit order dispatch (National Tariff Policy), is followed while preparing day-ahead power procurement plan. **The merit order should include energy charge of all available power plants, power exchange prices and prices of other short term arrangements**

Base load by Long term and variations through Short Term Market

- Discoms should sign PPA for the base demand only
- Seasonal variations and peak should be arranged through the short term market.
- This will help Discoms to limit over contracting the PPAs and save on the capacity charge as the peak and seasonal quantum is not required throughout the year.

Gate closure reduction in Intra Day Markets

- As of now, gate closure in international markets for Exchange traded products is 1 hour, whereas it is 4 hours in India
- This needs to be reduced to allow more liquidity and better load management for consumers and discoms.

Phasing out of Old Plants

- Thermal power plants over 25 years old should be phased out. At present this capacity is over 40,000 MW
- This can be now done as we have surplus generation capacity

Open access registry

- An Integrated IT based system, with access to all the OA Participants, Trade Intermediaries and National/Regional/State LDCs will help reduce date closure time in TAM products and also streamline issues related to non issuance or delay in NoC.

RPO Compliance

- Key States like Delhi, Bihar WB, UP, Haryana etc. remain RPO non-compliant
- SERCs should strictly enforce RPO and not allow any relaxations to the obligated entities.

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