

# **Enabling Framework for RE Integration in India – *Regulatory Perspective***

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# Disclaimer

- *Views expressed in the presentation do not represent the views of the Central Electricity Regulatory Commission*

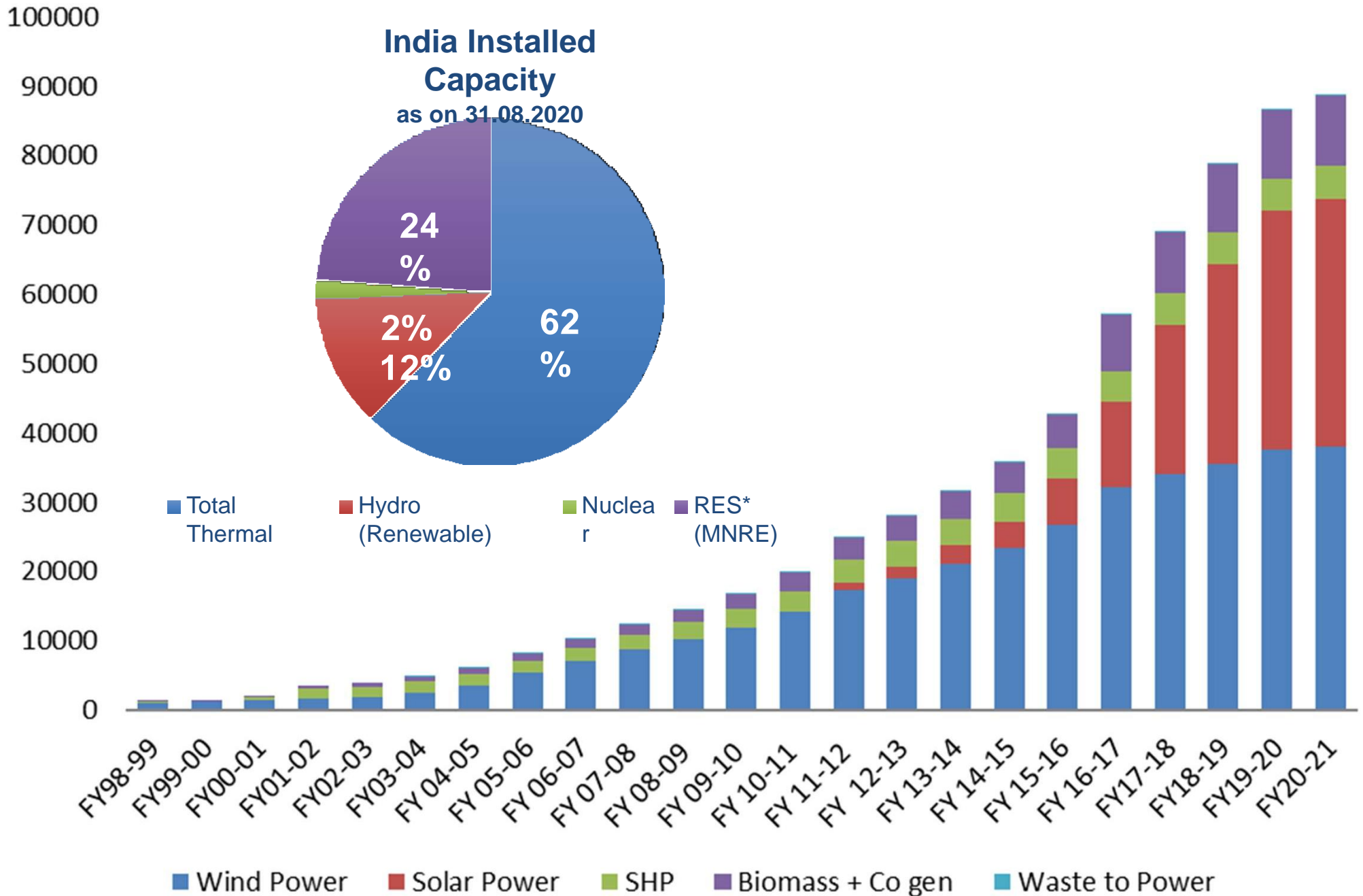
# Content

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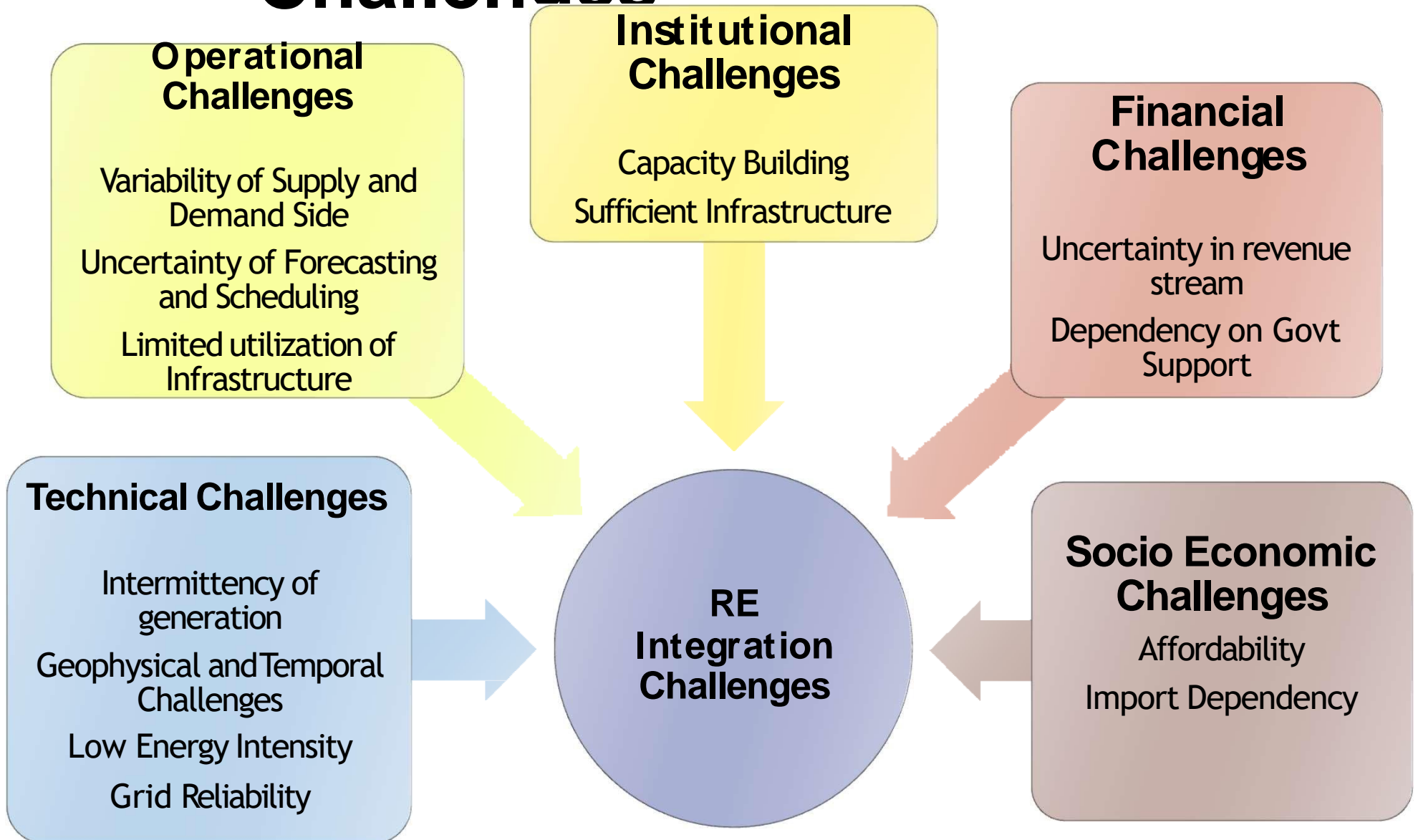


- RE integration –Challenges of Flexibility
- Current Power Market Status in India
- Scope for Optimization
- Key Initiatives
- Way forward

# Cumulative RE Installed Capacity (in MW) in India



# RE Integration- Challenges



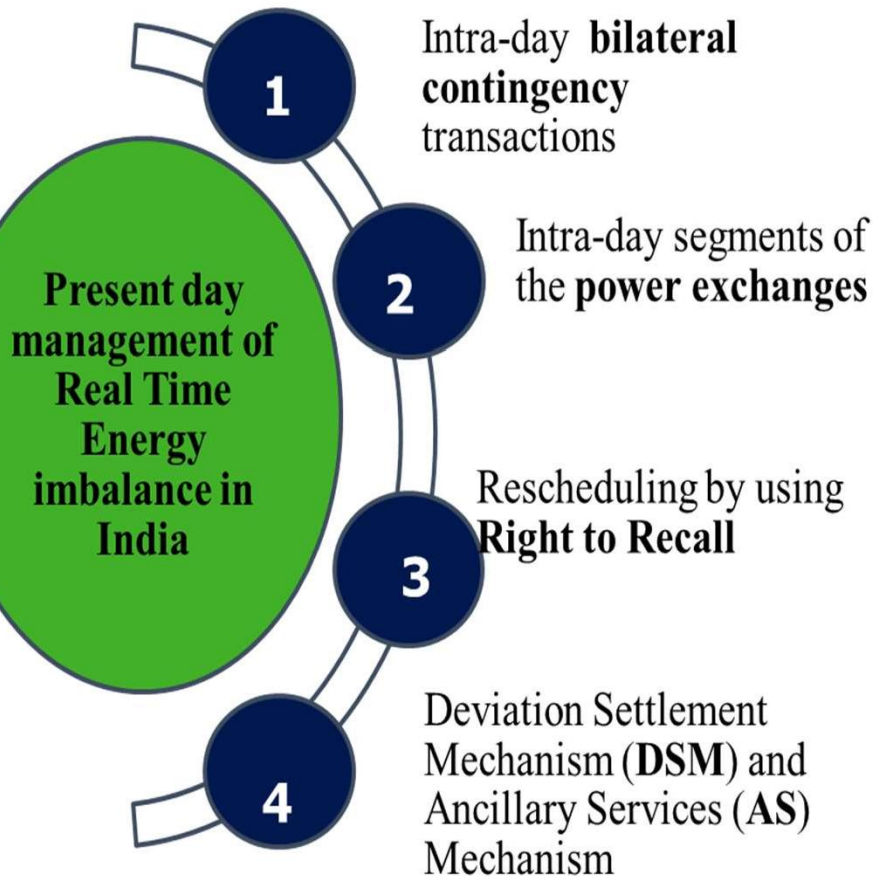


# India Power Market – Current Status

	FY 2009	FY 2020*
<b>Long Term</b>		
PPA for over 25 years through long term	<b>93.86</b> %	<b>89</b> %
<b>Short-Term</b>		
Exchanges	<b>6.1</b> %	<b>11</b> %
Through	<b>0.4%</b>	<b>4.0%</b>
Direct Bilateral	<b>3.2%</b>	<b>4%</b>
Unscheduled Interchange	<b>0.5%</b>	<b>1%</b>
	<b>2.1%</b>	<b>2%</b>

# Managing the energy imbalance

## Existing Mechanism and their Issues



### Treatment of DSM

- DSM is meant for last mile imbalance management and frequency control.
- **DSM used as an avenue for real time energy procurement and sale;**

### Liquidity in Power Exchanges

- **Volume traded** under intra-day market approx. 0.1 % of total generation
- Price discovery methodology of “Pay as you bid” instead of “Uniform Clearing price”

### Absence of Gate Closure

- **Right to Recall:** Non participation of URS in intra day market due to right to recall prior to 4 time blocks .
- **Absence of gate closure** prevents firmness of schedule .
- Ancillary services are being for longer period

***There is a need for real time market with Gate Closure to meet Real time imbalance with increase in RE penetration***

# Line of Demarcation between Energy and System imbalance



Market Operation – Framework			
<b>Categories of Market</b>	<b>Day Ahead Market (DAM)</b>	<b>Real Time Market (RTM)</b>	<b>System Imbalance/Ancillary Services Market</b>
<b>Purpose</b>	Energy Trade	Energy Trade	Inadvertent deviation management
Market Operation – India			
<b>Current</b>	DA (self-scheduling + Power Exchange (PX))	Deviation settlement Mechanism (DSM) + Ancillary Services (AS) + Intra-Day (PX) + Re-Scheduling (4 time blocks prior to dispatch)+ Intra-day contingency	
<b>Desirable</b>	DA (self-scheduling + PX)	Real Time Market (Hourly), with gate closure	DSM + AS

*A line of demarcation between 'energy trade' and 'system imbalance' handling is must*



# Optimization Closer to Delivery Period

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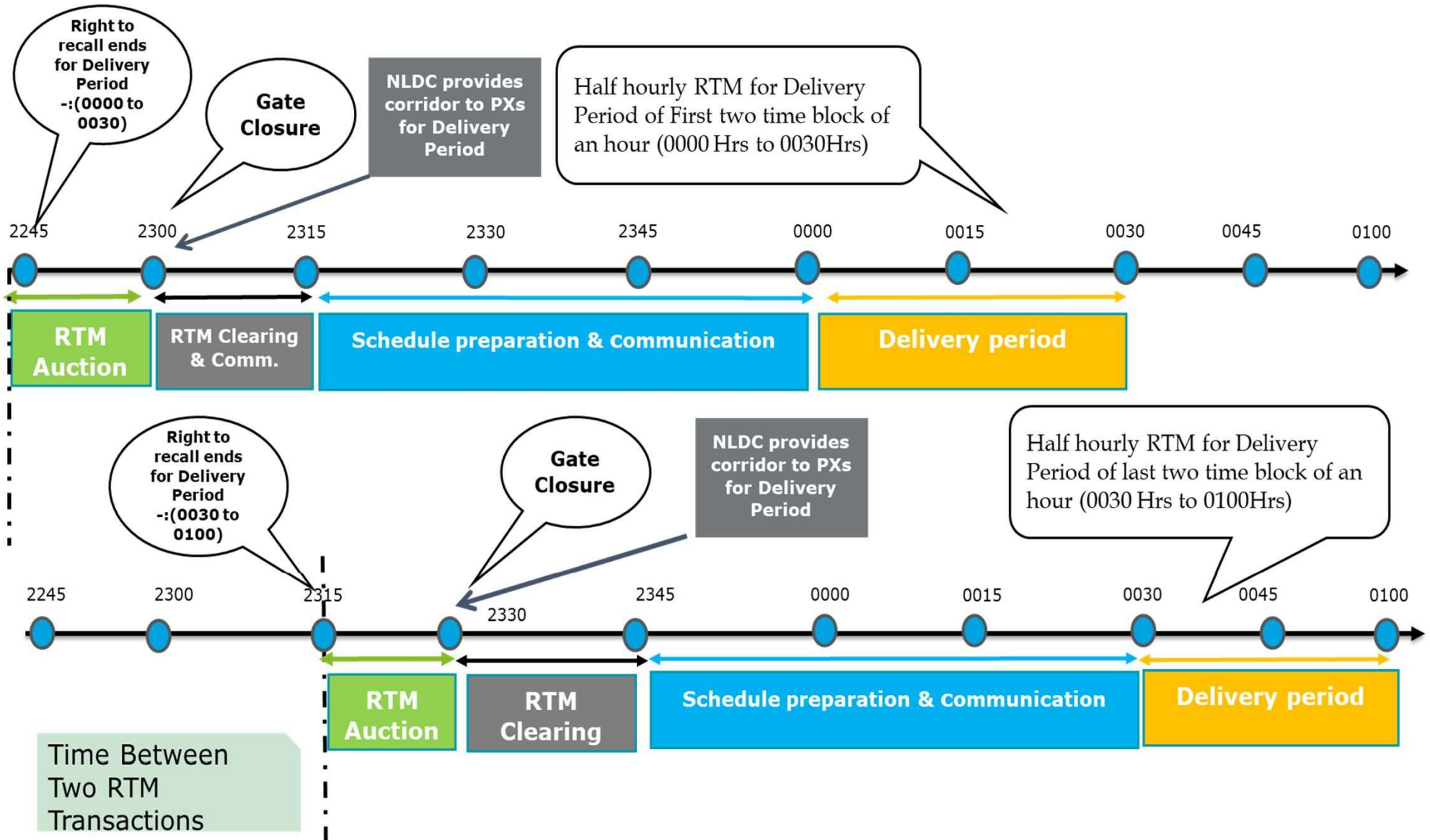
## Real Time Market

- Commenced **w.e.f. 1<sup>st</sup> June, 2020**
- **Delivery Period-** Half hourly market – 48 Market Runs in a day
- Concept of **gate closure** introduced

## Security Constrained Economic Dispatch (SCED)

- Optimisation of Inter-State Generating Stations (ISGS)
  - subject to security constraints and honouring existing scheduling practices
- Pilot Extended till March 2021.
- Average Net savings per day: ~INR 2-2.5 crs

# Time line for RTM Market

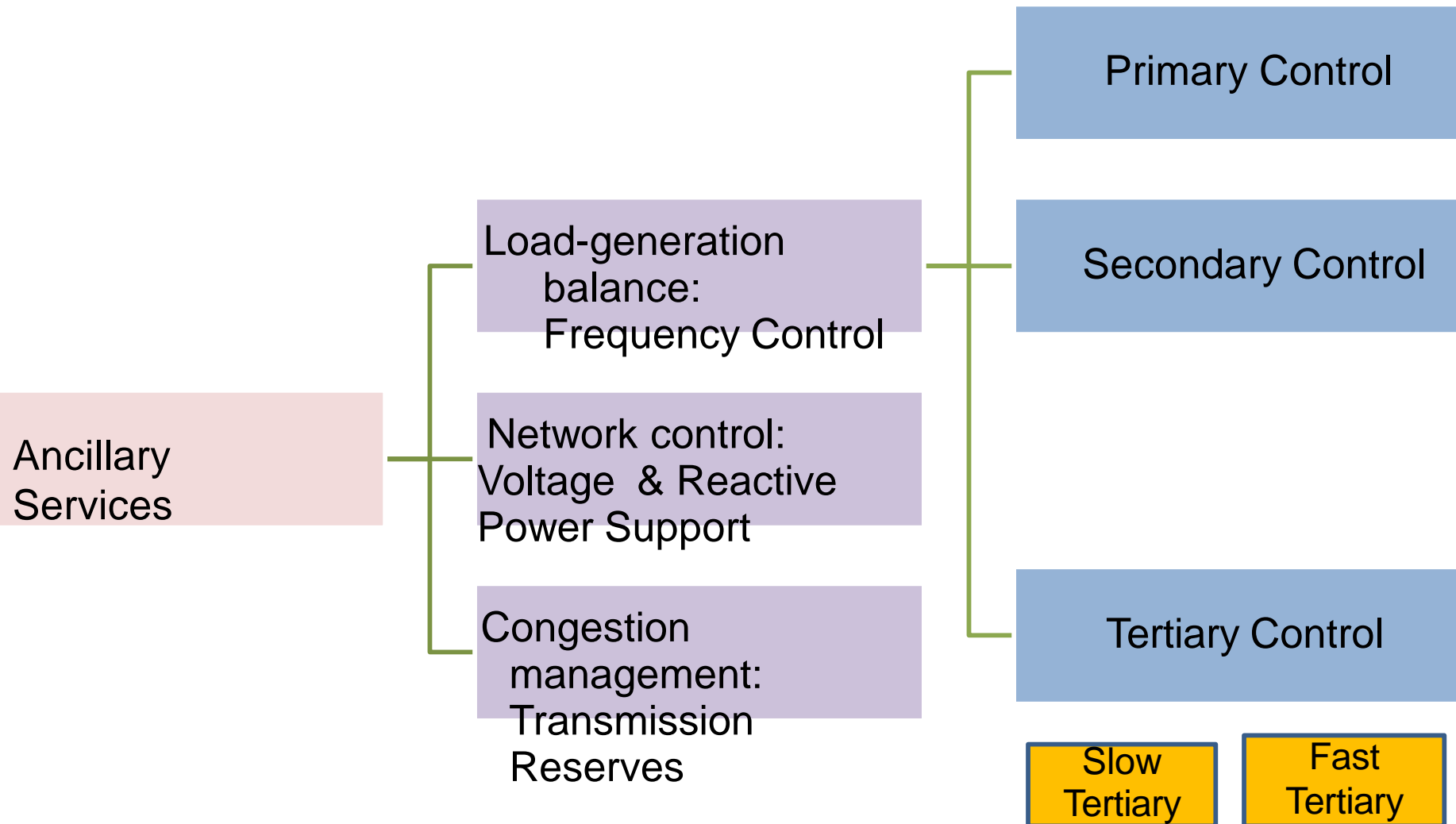


# Real Time Market –Features

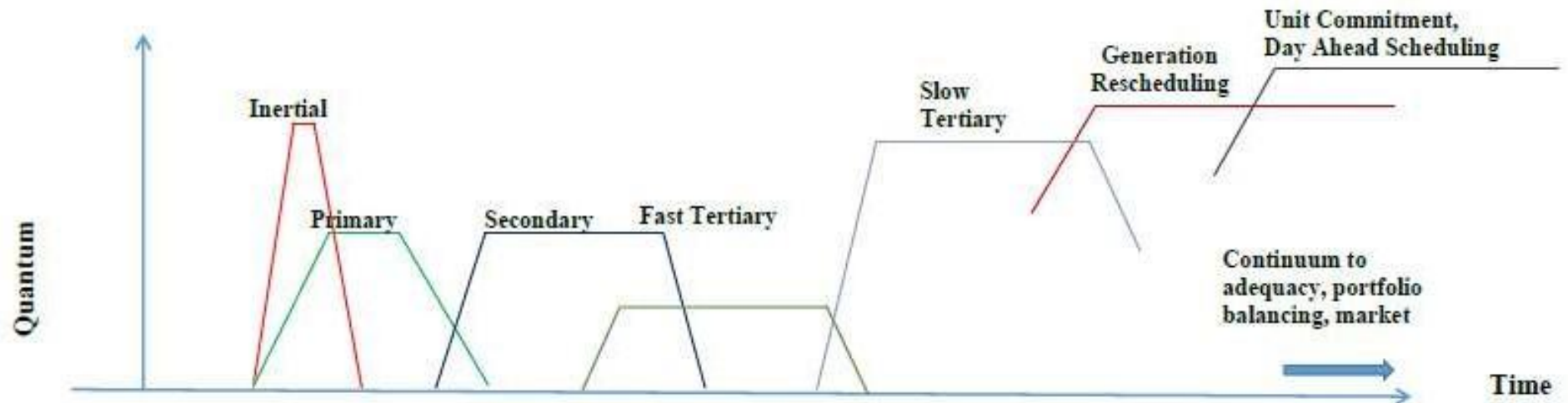


- Price Discovery mechanism** – double sided closed auction with uniform price – same as day ahead market
- Buyers/sellers shall have the option of placing buy/sell bids for each fifteen minute time block
- Generator having long term contract and participating in RTM will be required to share net gains
- RTM would be financially and physically bidding market
- Any deviation would attract charges as per DSM Regulations
- Necessary automation being planned to ensure, the RTM framework is able to facilitate faster transactions and settlements

# Ancillary Service in india



# Schematic of Reserves, Balancing and Frequency Control Continuum in India



Response → Attribute ↘	Inertial	Primary	Secondary	Fast Tertiary	Slow Tertiary	Generation Rescheduling/Market	Unit Commitment
Time	First few secs	Few sec - 5 min	30 s - 15 min	5 - 30 min	> 15 - 60 min	> 60 min	Hours/ day-ahead
Quantum	~ 10000 MW/Hz	~ 4000 MW	~ 4000 MW	~ 1000 MW	~ 8000-9000 MW	Load Generation Balance	Load Generation Balance
Local / LDC	Local	Local	NLDC / RLDC	NLDC	NLDC / SLDC	RLDC / SLDC	RLDC / SLDC
Manual / Automatic	Automatic	Automatic	Automatic	Manual	Manual	Manual	Manual
Centralized / Decentralized	Decentralized	Decentralized	Centralized	Centralized	Centralized/ Decentralized	Decentralized	Decentralized
Code / Order	IEGC / CEA Standard (?)	IEGC / CEA Standard	Roadmap on Reserves	Ancillary Regulations	Ancillary Regulations	IEGC	IEGC
Paid / Mandated	Mandated	Mandated	Paid	Paid	Paid	Paid	Paid
Regulated / Market	Regulated	Regulated	Regulated	Regulated	Regulated / Market	Regulated / Market	Regulated / Market
Implementation	Existing	Partly Existing	Yet to start	Yet to start	Existing	Existing	Existing

# Existing Framework for Ancillary Services

Type of Service	Outline	Response Time	Current Status
Primary response (Frequency Containment)	Automatic response delivering reserve power in negative proportion to grid frequency change	Few sec - 5 min	Mandated through IEGC  <i>Clause 5.2 (h) of IEGC states :- Coal/ lignite stations &gt; 200 MW, Gas stations &gt; 50 MW and hydro &gt; 25 MW operating at or up to 100% MCR shall normally be capable of picking up to 105/ 105/ 110% respectively of MCR when frequency falls suddenly</i>  <i>Generating station / unit not to be scheduled beyond 100% IC</i>
Secondary response (Frequency Restoration)	Supplementary corrective action needed to bring frequency back to 50 Hz.	30 s – 15 min	CERC Order for enablement of Automatic Generation Control (AGC) for ISGS stations <i>(Administrative mechanism in process)</i>
Tertiary response	All ISGS including Ultra Mega Power Plants (UMPPs), operating on part load and having URS availability on day ahead basis, are to be mandated	Within 60 mins	Implemented by POSOCO as per RRAS Regulation, CERC  <i>(Discussion paper issued by the CERCon Market based procurement for tertiary reserves)</i>

# Green Term Ahead Contract – (GTAM)

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- **Green TAM** : Commenced w.e.f. 21<sup>st</sup>Aug, 2020
- **Product types – Green intra-day, Green Day Ahead Contingency, Green Daily and Green Weekly**
- Additional mechanism to fulfill RPO obligations solar and non-solar
- Matching mechanism – continuous
- National market

# Market Based Economic Dispatch

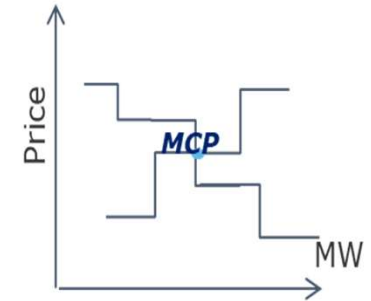
## Pooling of buy / sell bids

- All generation plants (State, Central, IPPs) would declare their availability bids on a **day ahead basis** and all discoms would declare their day-ahead requirement/schedule to a centralized pool
- Gencos and Discoms will submit **price bids**



## Scheduling and dispatch

- Preparing **national merit order** stack and determination of **Market Clearing Price (MCP)** for each time block
- Plants having **lower VC** would be dispatched to their full DC
- **Costlier plants** to be backed down / run optimally
- Discoms would meet their total demand from **greater portfolio of cheaper generation plants**



## Pay in and pay out

- Discoms would pay the MCP for cost of power procured
- Market operator would repay the MCP to the generators who are cleared



## Bilateral settlement

- Existing contracts with generators would continue to be honored
- For portion of demand met through existing contracts, generators would refund difference in MCP and contract price to discoms; discoms pay fixed cost to gencos outside the market
- For the contracted capacity - not requisitioned by discom but sold by genco - net revenue earned by generator, over and above its variable cost, shall be shared with the discom in the ratio of 50:50



# Way Forward

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- Supply Side Variability and Uncertainty
  - Intermittency of RE
- Need to decrease the Risk of curtailment
- Need of Flexibility from both geographical and temporal perspective
- Strong grid to balance Supply and Demand at Least Cost

***THANK YOU***

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