



# Power Portfolio Management for DISCOMS

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Dec 12, 2017

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# Outline

## **Core Issues faced by DISCOMS**

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### **What are the Problems?**

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## **Fundamentals of Power Portfolio Management**

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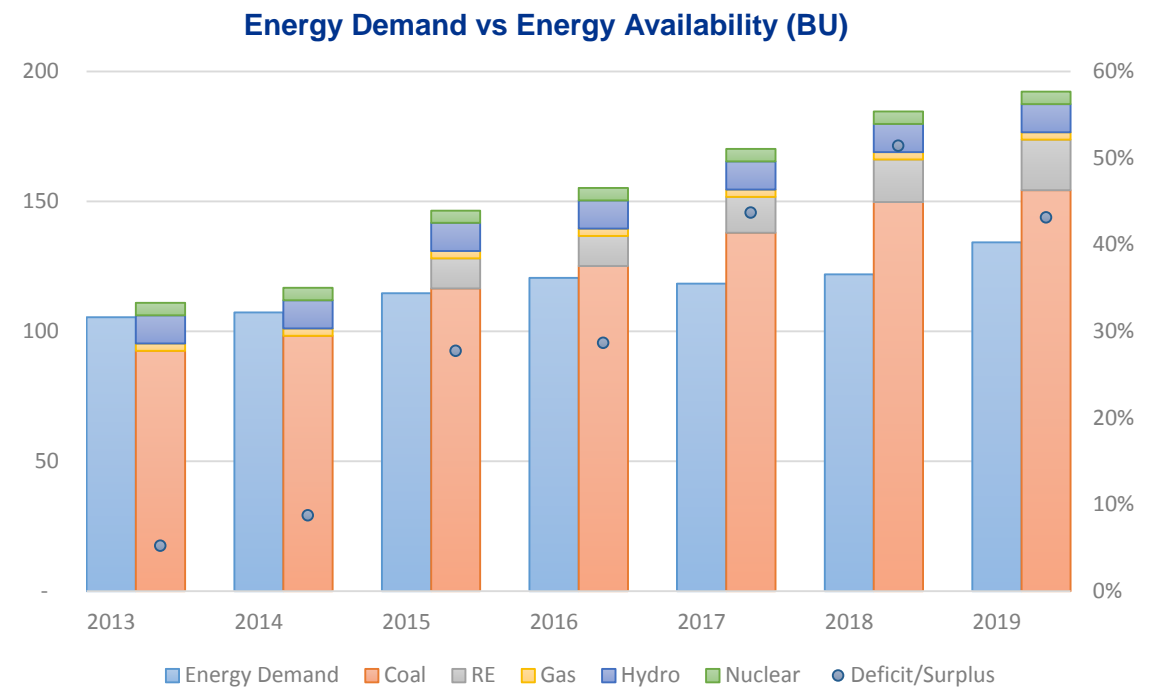
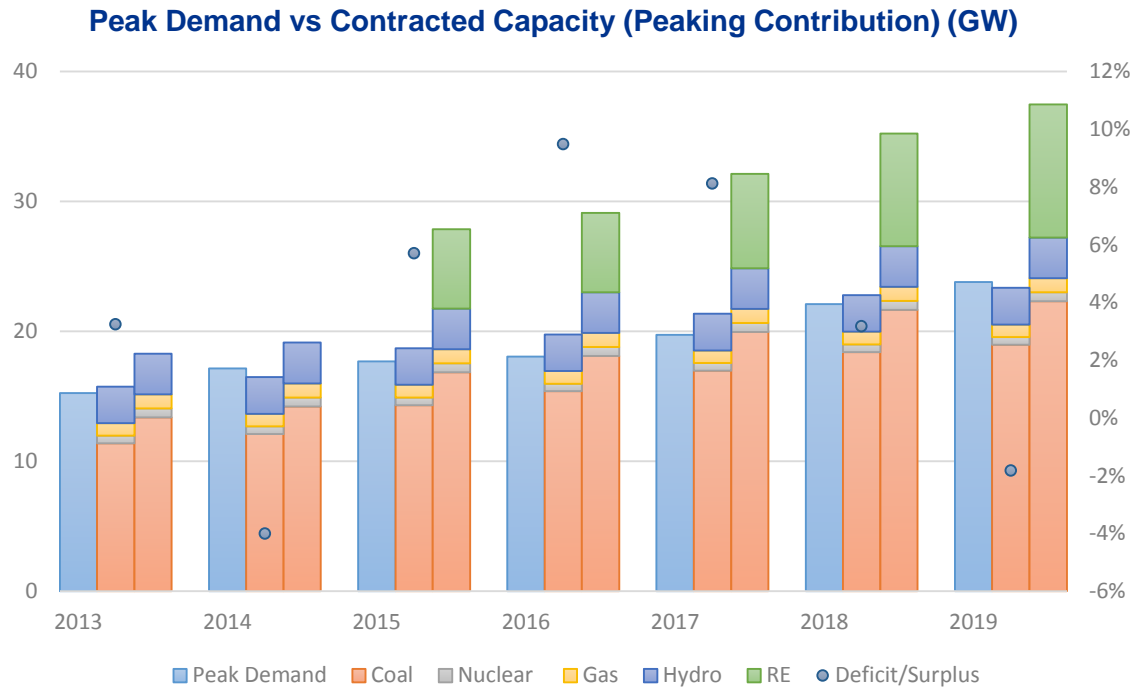
### **What are the Solutions?**

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WHAT ARE THE PROBLEMS?

# Capacity Type Mix and Volumes in Long Term Contracts are Suboptimal

## PROBLEM 1: MSEDCL LONG TERM AGREEMENTS



Source: KPMG Analysis

- Post 2013, all Long Term Contracts in MSEDCL are based on Coal and Renewable Energy Only (53:47)
- Peaking Deficits may still exist, while Energy is surplus
- The total back down of coal reported in 2015-16 was 19% and 2,828 Crores of Fixed Costs burden (MSEDCL Petition 2016-17)

Note: Peaking Contribution for Renewables has been assumed as Zero. Availability Norms and PLF as per CEA Technical Standards



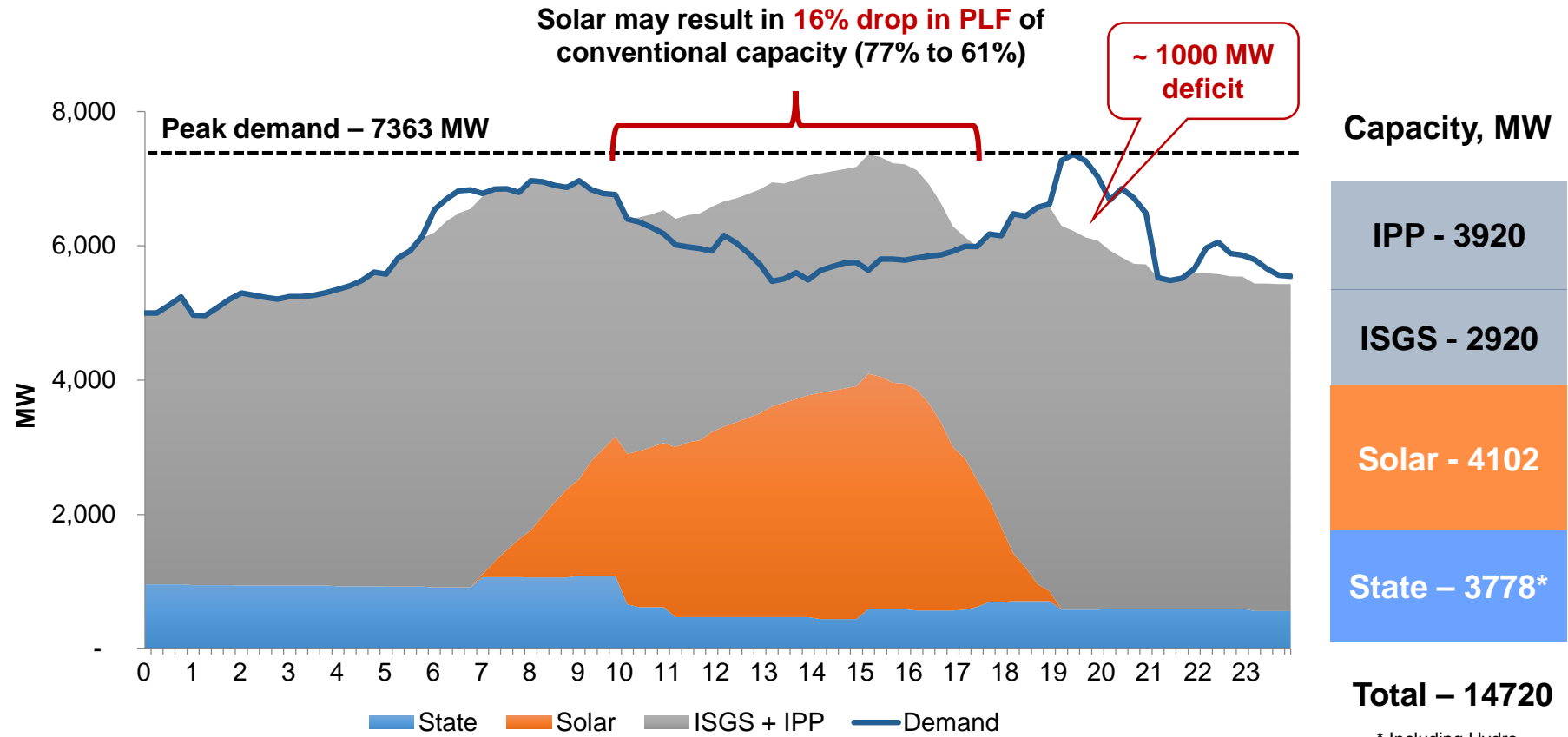
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WHAT ARE THE PROBLEMS?

# Long Term Solar Contracts without Supporting Flexibility

## PROBLEM 2: PSPCL TARGETS FOR SOLAR

Punjab - Daily load curve and likely supply stack (April 2019)



Source: KPMG Analysis



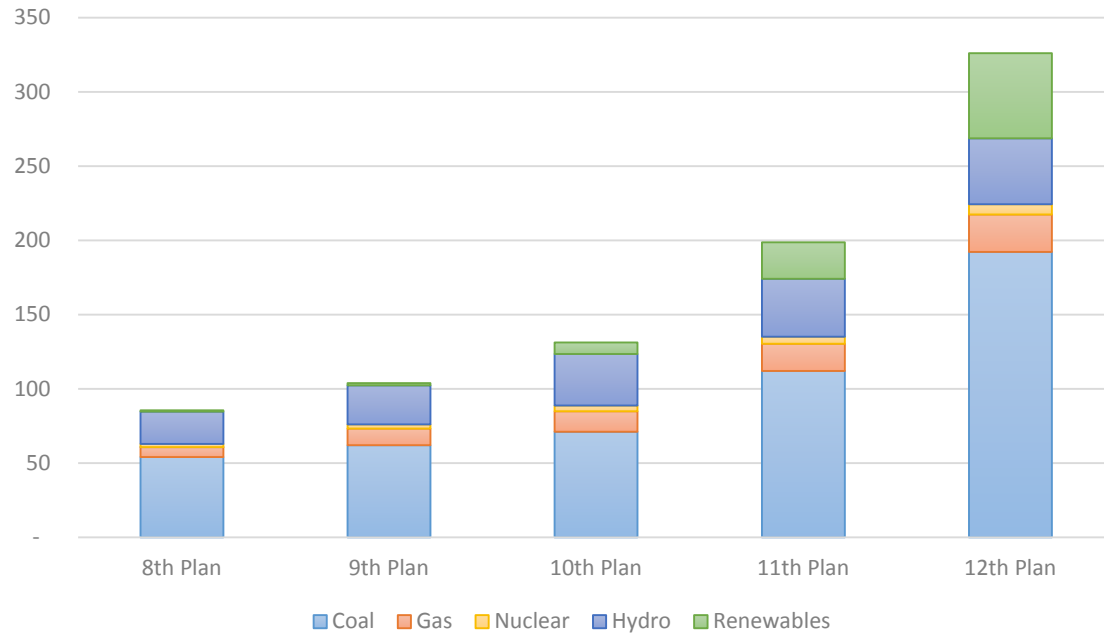
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WHAT ARE THE PROBLEMS?

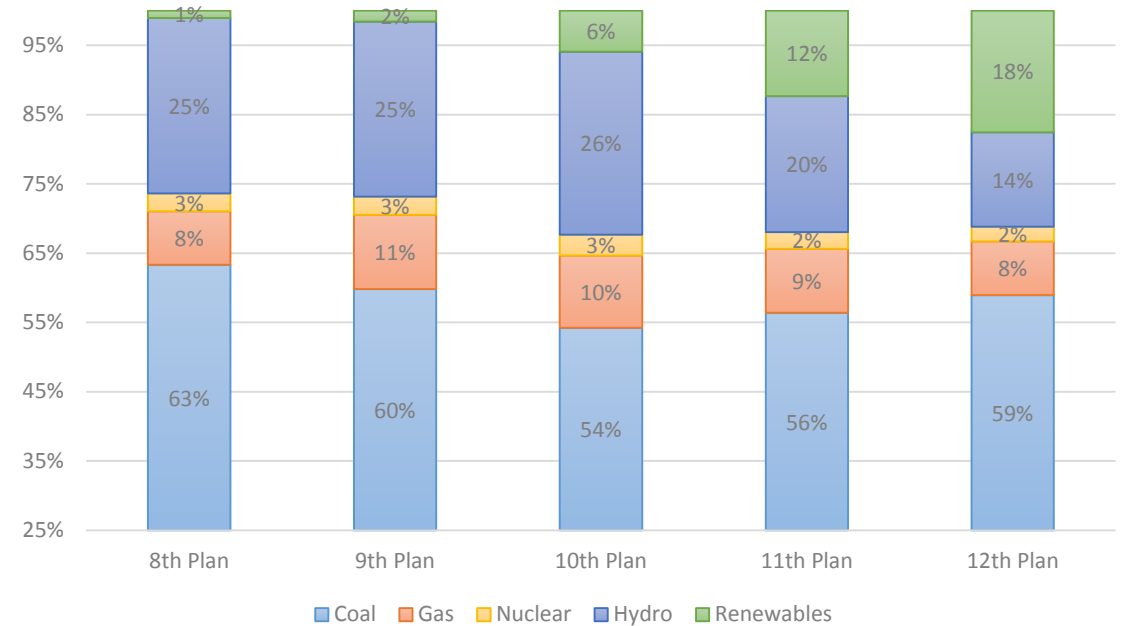
# Coal and Renewables dominate the Capacity Mix

## PROBLEM 3: INADEQUATE CONSIDERATION OF FLEXIBLE CAPACITY IN RESOURCE MIX

Capacity additions by end of each Planning Period (GW)



Capacity Mix by end of each Planning Period (%)



Source: CEA, KPMG Analysis

- **No takers for Peaking Capacity and Flexibility has led to sustained investments in Coal and Renewables**
- **170 GW (88%) out of 194 GW Capacity addition in last 10 years is based on Coal and Renewables**
- **Peak Demand is about 160 GW**



## WHAT ARE THE PROBLEMS?

# Medium Term Contracts have not taken off

## PROBLEM 4: NATIONAL SCENARIO - LIQUIDITY IN THE MEDIUM TERM MARKETS IS VERY LOW

### Medium Term PPAs BY various DISCOMS

State (Buy)	Region	Plant (Seller)	Capacity	Period of Sale		Rate
			MW	From	To	Rs./kWh
Maharashtra (MSEDCL)	NEW Grid	Adani Power Ltd.	300	Aug-11	Oct-12	4.10
Maharashtra (MSEDCL)	NEW Grid	JSW Energy Ltd.	475	Oct-11	Oct-12	4.10
Maharashtra (MSEDCL)	NEW Grid	Adani Power Ltd.	800	Mar-11	Feb-12	4.10
Maharashtra (MSEDCL)	NEW Grid	JSW Energy Ltd.	200	Mar-11	Feb-12	4.10
Maharashtra (R Infra)	NEW Grid	Wardha Power Company Limited	260	Apr-11	Mar-14	4.85
Maharashtra (R Infra)	NEW Grid	Abhijeet MADC Nagpur Energy Private Ltd	55	Apr-11	Mar-14	4.80
Maharashtra (R Infra)	NEW Grid	Vidarbha Industries Power Limited	134	Apr-11	Mar-14	4.80
BSEB	NEW Grid	Adani Gujarat	200	Mar-12	Dec-15	4.42
Andhra Pradesh, APCDPDCL	SR Grid	KSK Mahanadi Power Company Limited	400	Jun-13	Jun-16	4.29
Andhra Pradesh, APCDPDCL	SR Grid	Corporate Power Limited (Abhijeet Group)	150	Jun-13	Jun-16	4.39
Karnataka, PCKL	SR Grid	Ideal Energy Pvt. limited	200	Aug-13	Jun-15	4.79
Karnataka, PCKL	SR Grid	Essar Power - Mahan Power plant	300	Aug-13	Jun-15	4.90
Karnataka, PCKL	SR Grid	GUVNL	1,000	Aug-13	Jun-15	4.90
TANGEDCO	SR Grid	JPL (Jindal)	200	Sep-12	Aug-17	4.91
TANGEDCO	SR Grid	Adani Gujarat (Mundra)	200	Sep-12	Aug-17	4.99

High Prices  
vis-à-vis Long  
Term Market

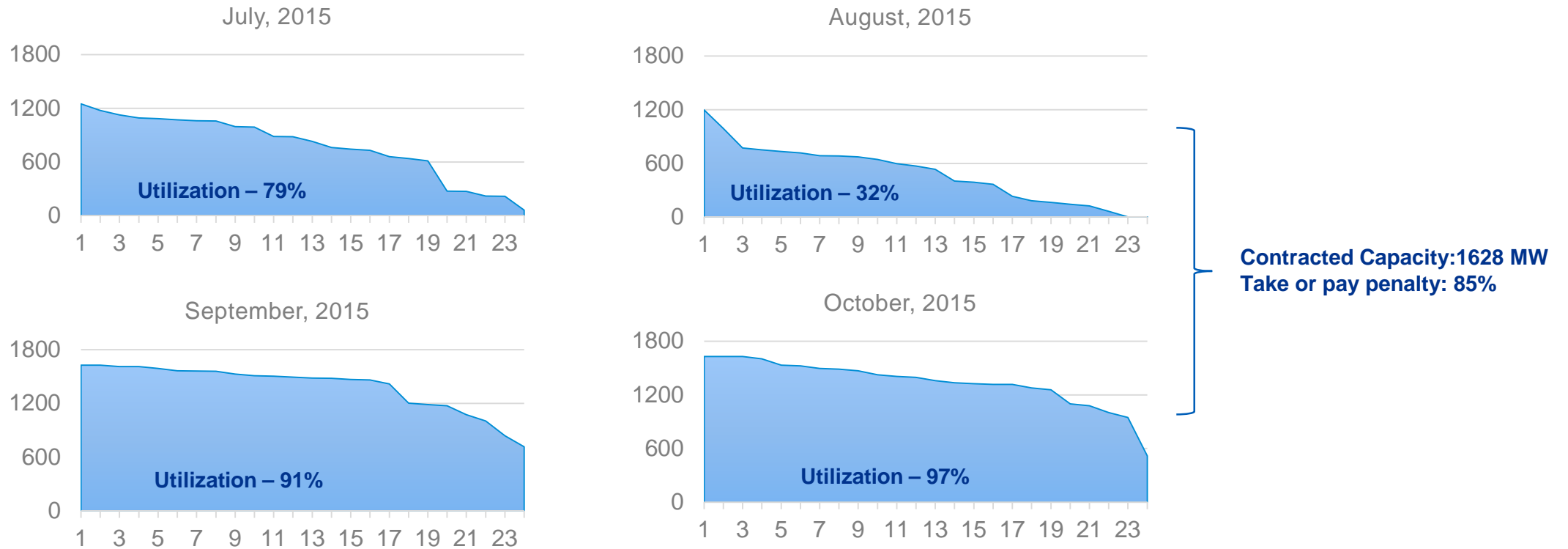
Source: SERCs, Tariff Orders

- Few DISCOMS active in the Medium Term Market – Understanding of the Value Proposition of Medium Term Contracts is absent
- Contracts witnessed only on account of time gap arrangement for commissioning of Long Term Agreements, and intent to block corridors by certain Southern states

# Sub optimal Structuring of Short Term Contracts

## PROBLEM 5: INADEQUATE SHORT TERM CONTRACTS BY TELANGANA STATE DISCOMS

Average Daily Utilization “Time Duration Curves” of Short Term Bilateral Contracts of TSDISCOMS in FY16



- **Poor Utilization of Short Term Contracts in July and August led to INR 121 Crores in Penalty**
- **Short term Contracts not structured to match the load requirements**

Source: CEA, KPMG Analysis



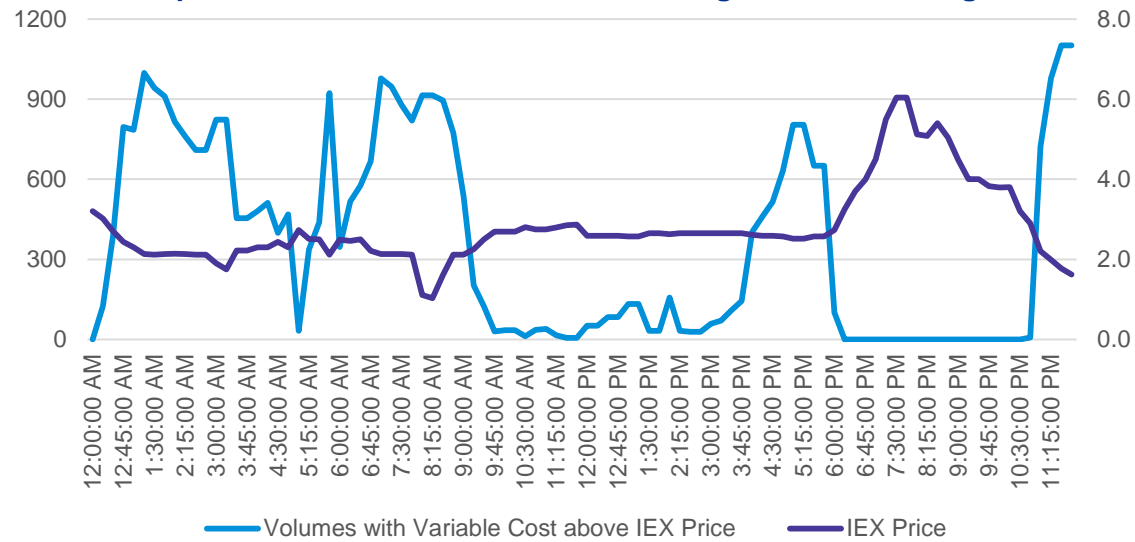
WHAT ARE THE PROBLEMS?

# Sub optimal Day Ahead Operations

## PROBLEM 6: LIMITED DAY AHEAD OPTIMISATION ON EXCHANGE BY TELANGANA STATE DISCOMS

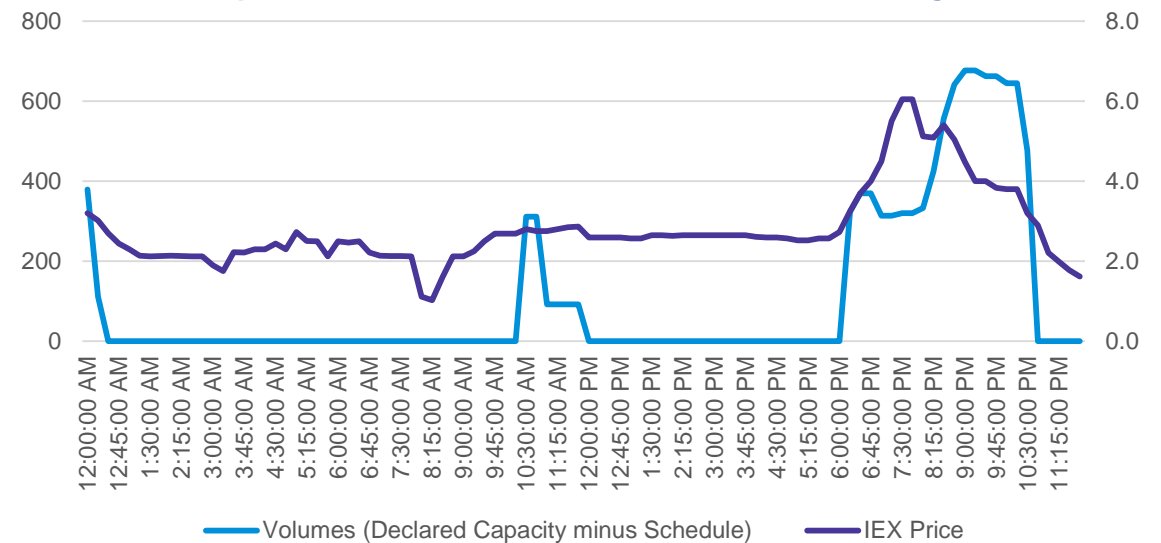
### BUY OPPURTUNITIES

Dispatched Volumes with Variable Cost higher than Exchange



### SELL OPPURTUNITIES

Undispatched Volume with Variable Cost below Exchange



Source: TSLDC, KPMG Analysis

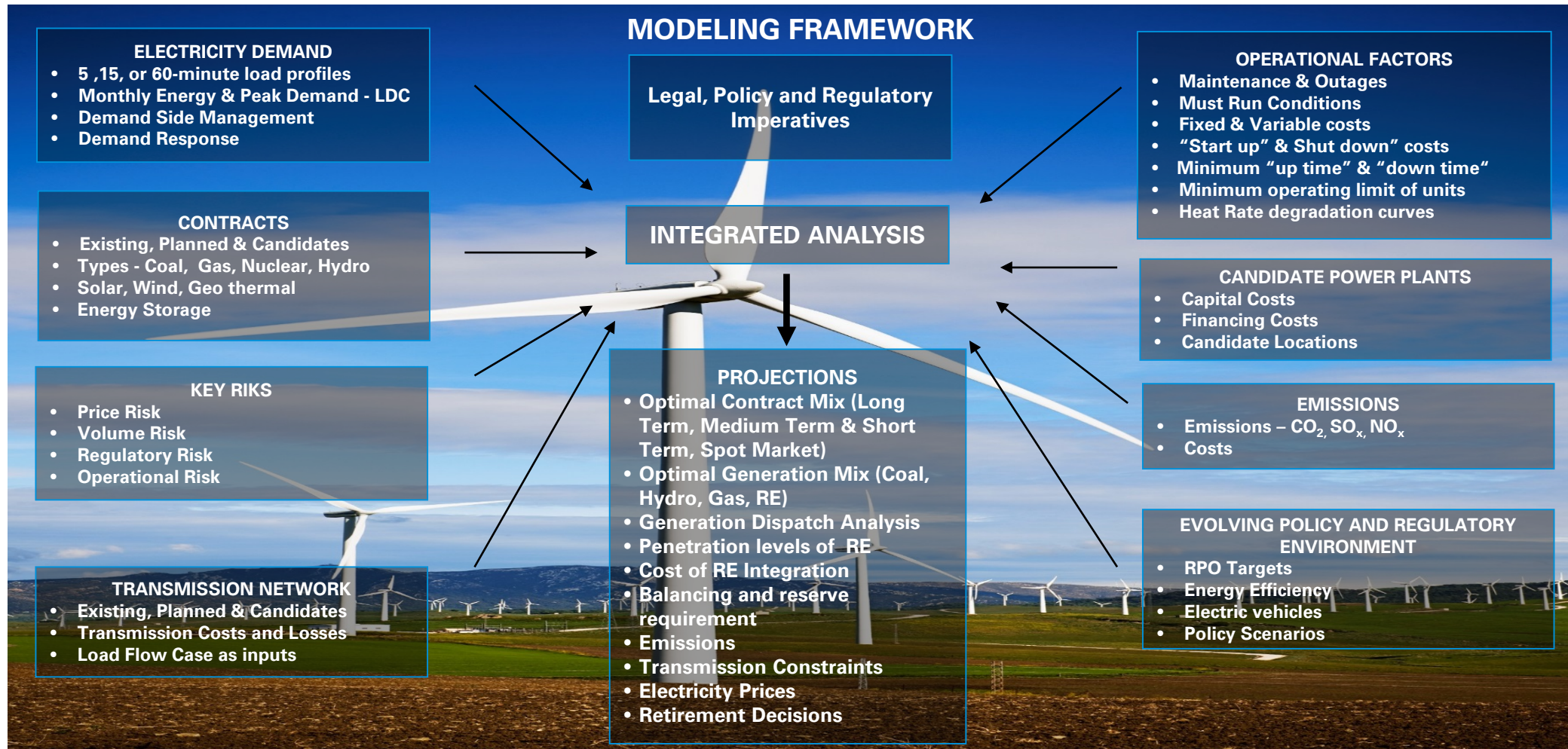
- Day Ahead Optimisation through Exchanges not being fully explored
- Critical for balancing the Long & Medium Term Position for additional Savings or Revenues





## WHAT IS THE SOLUTION?

# Framework for Power Portfolio Optimisation



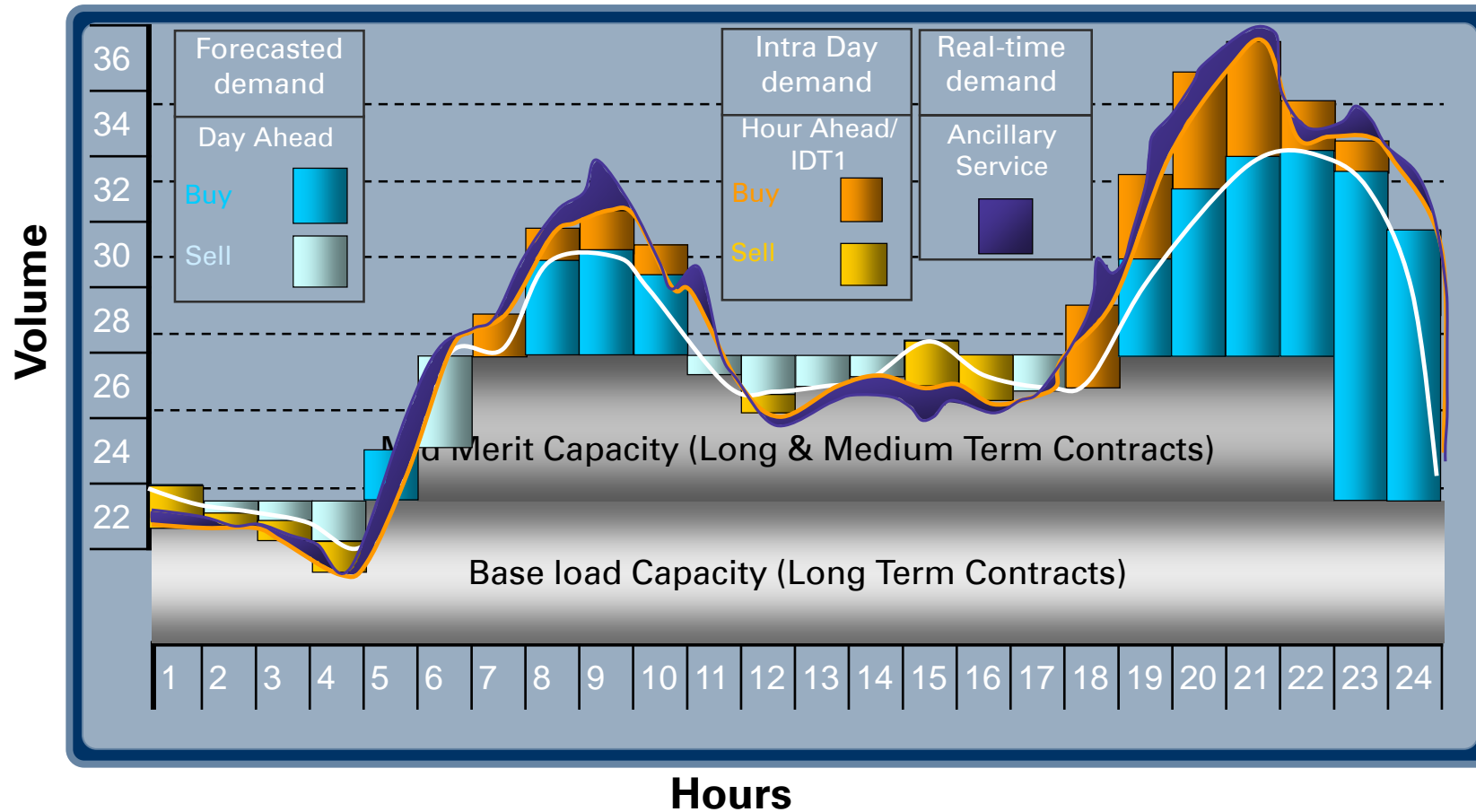
Power Procurement Planning based on "chronological" rather than discrete grid conditions with a layered 3 tier optimization for accounting for Federal vs State Imperatives



THANK YOU.

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# Approach for Power Procurement Optimisation

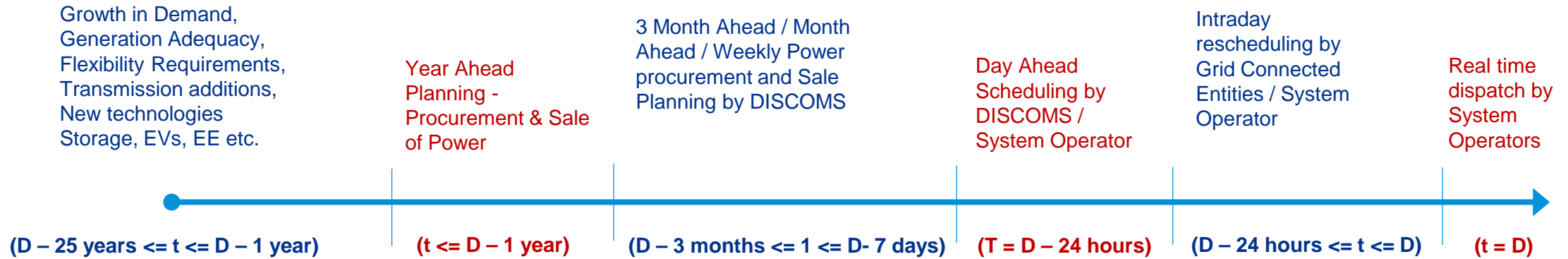


- Power Procurement Planning should take into account the “Time Chronology of Demand” and “Net Demand” Considerations”
- Planning should be reviewed and updated on a rolling basis every year

## WHAT IS THE SOLUTION?

# Power Procurement Planning on "Seconds to Decennium Scale"

## Planning and Operational timescales have strong linkages



### 1. POWER PROCUREMENT PLANNING TOOLS



### 2. ELECTRICITY DEMAND FORECASTING TOOLS

### 3. SHORT TERM & DAY AHEAD POWER PROCUREMENT COST OPTIMISATION

- Month Ahead, Week Ahead, Day Ahead and Intraday Load Forecasting
- Price Forecasting
- RE Integration
- Scheduling Optimisation

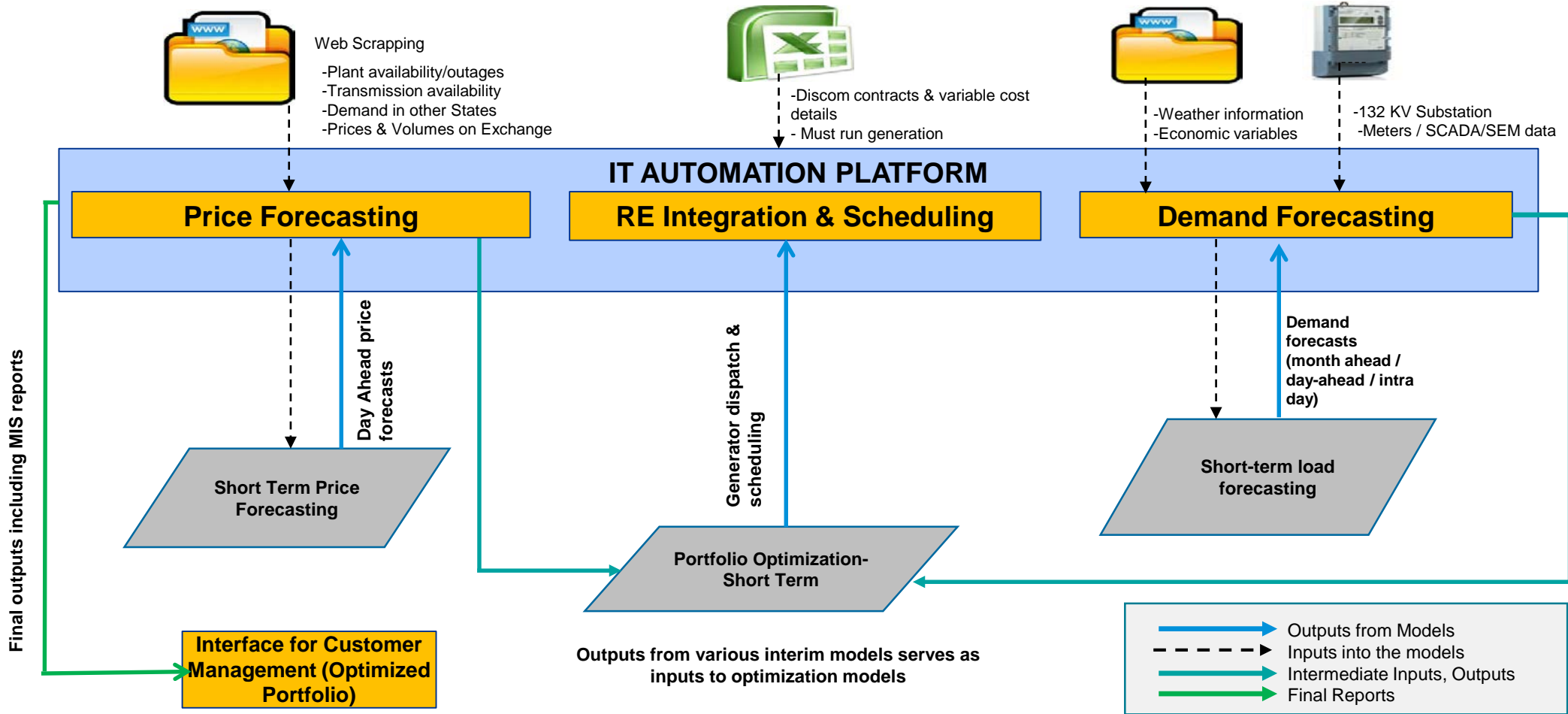
# 2. Long term Electricity Demand Forecasting Models

Suite of Econometric and Simulation based models to capture the economic, policy and technological trends

	MODEL	KEY INPUTS	KEY OUTPUTS
 <p><b>Econometric Approach</b></p>	<ul style="list-style-type: none"> <li>✓ <b>Decomposition of demand into Seasonality, Trend and Residual effects</b></li> <li>✓ <b>Panel Data approach including the weather effects</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ Economic</li> <li>▪ Demographic</li> <li>▪ Past demand</li> <li>▪ Electricity Price</li> <li>▪ Weather &amp; Climate conditions</li> </ul>	<ul style="list-style-type: none"> <li>▪ <i>Hourly demand forecast</i></li> <li>▪ <i>Monthly Energy &amp; Peak</i></li> <li>▪ <i>Annual Energy &amp; Peak</i></li> </ul>
 <p><b>Computable General Equilibrium</b></p>	<ul style="list-style-type: none"> <li>✓ <b>Changes in Market Structure</b></li> <li>✓ <b>Uncertainties related Policy and new technology – SRT, Evs, Smart Grids etc.</b></li> <li>✓ <b>Separates substitution effects of electricity prices and other prices</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ Input-output table (IOT)</li> <li>▪ Sector specific policies – targets and achievements</li> </ul>	<ul style="list-style-type: none"> <li>▪ Annual electricity demand forecast</li> <li>▪ Policy impact analysis</li> <li>▪ Micro-level substitution resulting from adverse BoT</li> <li>▪ Macro-economic income impact on demand</li> </ul>

Capture the temporal and spatial variations in demand for mitigation of the grid operational constraints

# 3. Power Procurement Cost Optimisation on Short-term and Day Ahead basis



**RE Integration on large-scale enabled by improvements in scheduling optimization and operations**