Deloitte.

Case Study: India

May 2022

Power Market Structure

Self-Scheduling of Long-Term contracts dominate Power Market Transactions

Products on the Power Markets

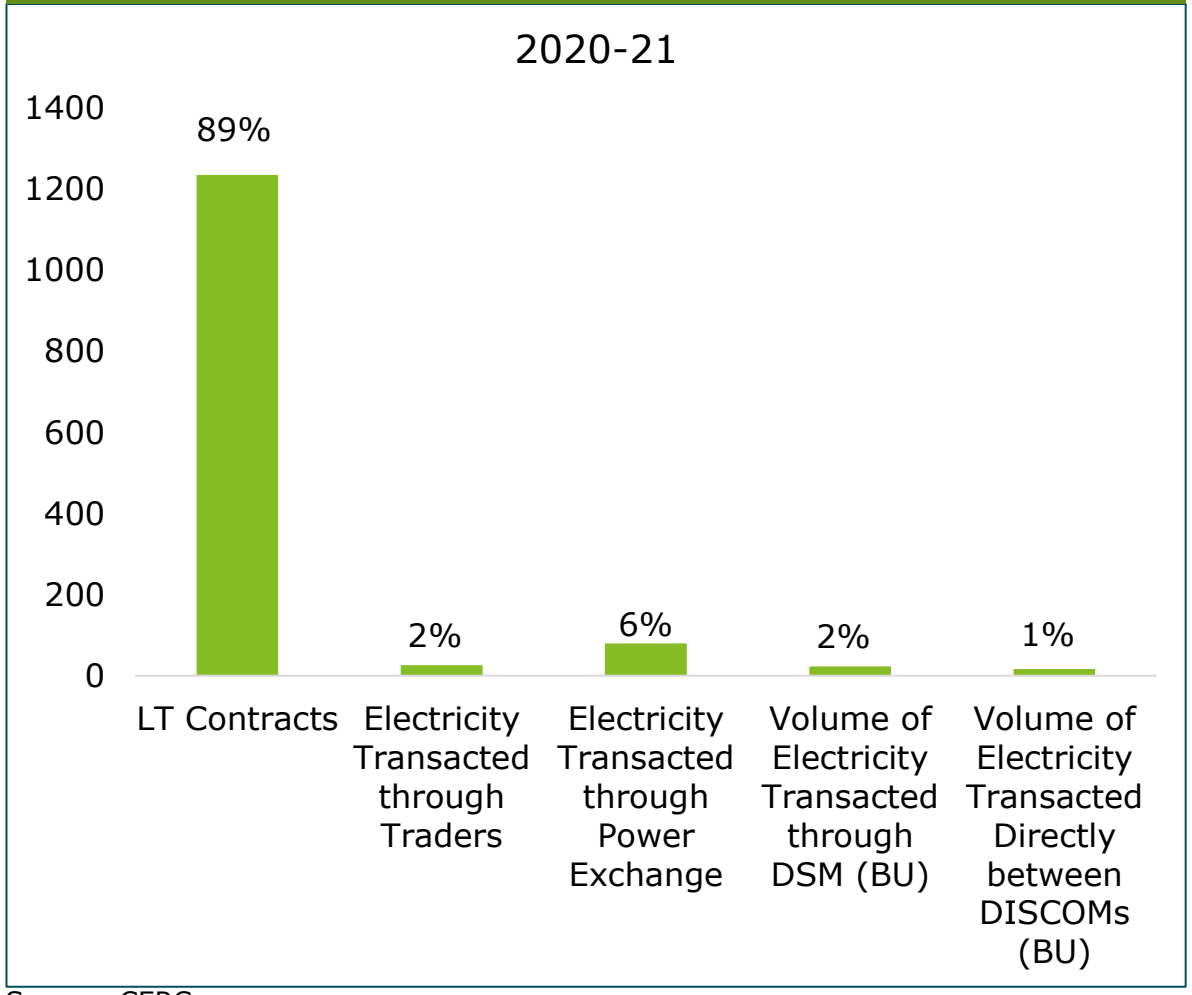
Day-Ahead Scheduling

- Long Term Power Purchase Agreements (12-25 Years)
- Medium Term Power Purchase Agreements
- Short-Term Bilateral
- Day-Ahead Market on PX
- Day-Ahead Contingency Market on PX

Real Time

- Rescheduling of LT PPAs
- Real-Time Markets on PX
- Intra-Day markets on PX
- Deviation Settlement Mechanism/ Ancillary Services

Composition of Power Markets



Source: CERC

Planning Process

Though the generation sector is delicenced, planning continues to be guided centrally

01 **CEA Long Term Demand Forecast – Electric Power Survey : This is the primary national level demand forecasting exercise conducted periodically to inform planning at the national and state level**

02 **National Electricity Plan (Generation & Transmission): Statutory Planning Activity undertaken by CEA to formulate short-term (5 years) and perspective (15 years) plans for development of the electricity system and coordinating the activities of various planning agencies. For use as reference document by industry participants**

03 **CEA's report on Optimal Generation Capacity Mix for 2029-30 : This report is not a regular publication. The report highlights the capacity additions required for meeting climate goals and policy targets of renewables.**

04 **Multi-Year Tariff Filing and State-Level Plans: These are planning exercises conducted periodically at the state level for identifying resources required to meet projected demand, which are subsequently submitted for regulatory approval**

*Though generation has been delicensed under the Electricity Act 2003, the government from time to time publishes reports identifying the need for additional resources to meet demand

* An important aspect of planning included reports of the Working Group on Power by the Planning Commission which used to set targets for generation capacity. However, the Planning Commission has been dissolved and the last 5-year targets were framed till 2017

Key factors that triggered overcapacity in India

Multiple factors have contributed to the surplus capacity creation

01

Demand Slowdown or deviations from projections of CEA

- **Higher estimates of demand were used for estimating future deficits and subsequent contracting**
- **Even for meeting seasonal deficits, long-term base load PPAs were the preferred contracting mechanism**

02

The shallow spot markets, which are residual in nature, sent out wrong signals for capacity creation and a large fleet of capacity was planned purely on a merchant basis. Capacity overhang and low prices in spot markets also limited ability of utilities to dispose surplus power from contacted capacities in spot markets

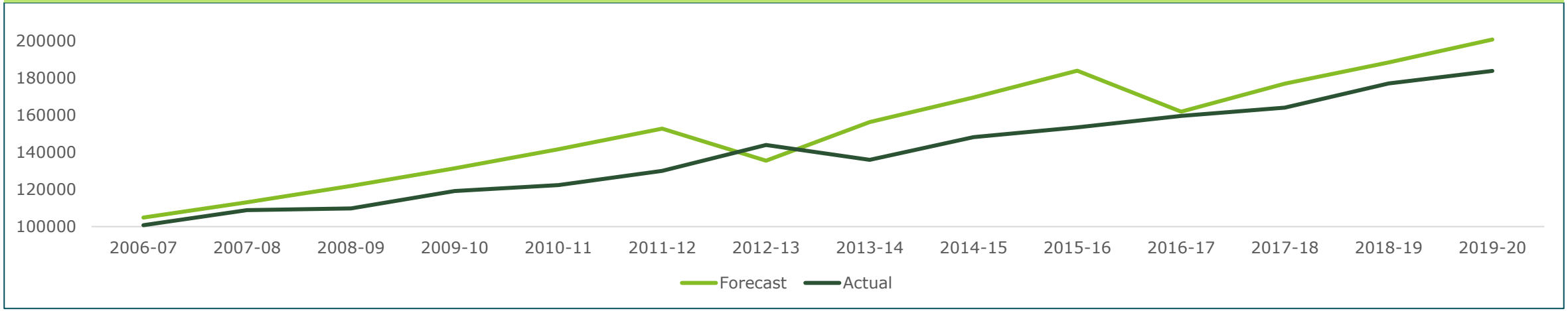
03

Migration of large retail consumers to the open access or group captive mode may also be a factor that resulted in surplus capacity with distribution utilities. Studies indicate that ~10-25% of backing down may attributed to migration of large retail consumers

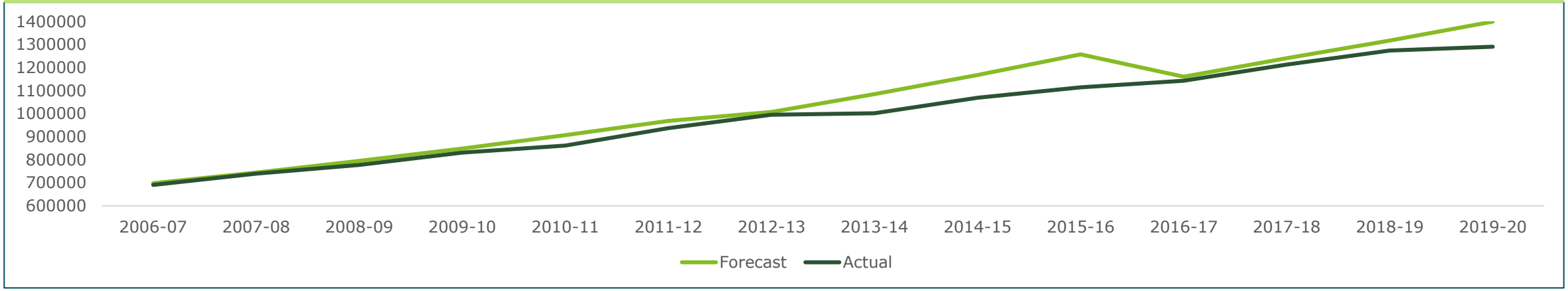
Key Factors for Over Capacity – Demand Forecasting Errors

States use the forecasts from the Electric Power Survey of CEA for contracting and the CEA forecasts are observed to have an upward bias, leading to over contracting

Forecast of All India Peak Electricity Demand (Utilities) As Per 18th & 19th Electric Power Survey and Actuals in MW



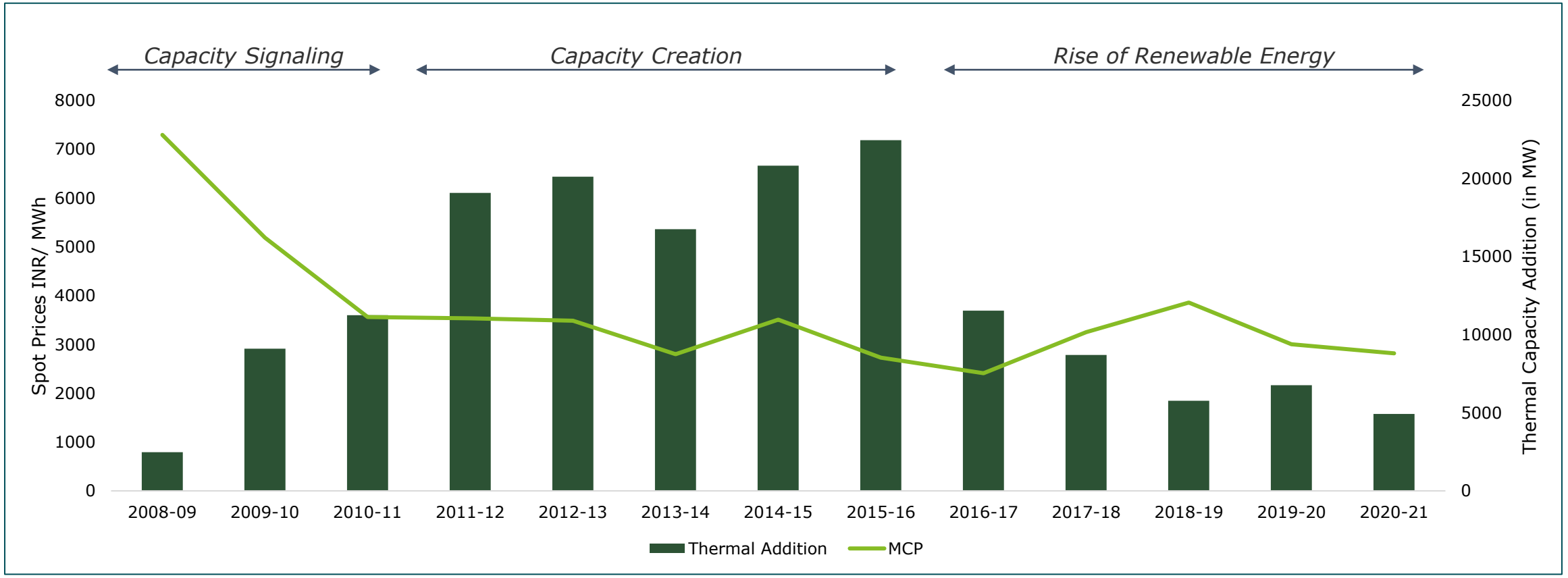
Forecast of All India Energy Requirement (Utilities) As Per 18th & 19th Electric Power Survey and Actuals in GWh



Source: CEA

Key Drivers for Over Capacity – Shallow markets have over-signaled

- The high prices in the spot markets are generally indicative of capacity shortage and eventually signal new merchant capacity to come up
- The shallow markets have sent out wrong signals which led to huge capacity creation and the immediate rise of renewable energy following the capacity expansion led to challenges in absorption.
- Low prices further limit ability to sell contracted power in spot markets leading to stranding



Source: CERC, IEX

Stranded Capacity across Indian states

Due to the take-or pay nature of long-term contracts, surplus capacity has huge financial implications

Quantum of Capacity backed down in various Indian states (2015-16)		
	Backing down reported (MW)	**% of contracted capacity**
Maharashtra	4,231	19%
Punjab	3,457	27%
Rajasthan	1,798	14%
Madhya Pradesh	2,444	17%
Gujarat	5,525	30%

Financial Implications of Backing down (2015-16)		
	Estimates of Fixed cost payments due to backing down (₹ Cr)	**% of total fixed cost payments to generators**
Maharashtra[#]	2,828	21%
Punjab	3,006	33%
Rajasthan	1,051	16%
Madhya Pradesh	2,177	28%
Gujarat	3,823	36%

Source: Prayas Energy Group

Backed down refers to available power not scheduled due to lower demand
[#]For Maharahstra, the figures are for 2016-17

Surplus Capacity has induced distribution utilities to renege on PPAs

PPA renegotiation: NLC ultimatum to Rajasthan govt on two projects – The Hindu Business Line, Jan 08, 2018

The heart of the matter is two coal-fired power projects of 250 MW each — Barsingsar Extension and Bithnok — which the ₹8,600-crore NCL plans to put up in Rajasthan and the PPA for which was signed in 2010 and reconfirmed in 2012. It is understood that the tariff was around ₹4.50 per kwh. The project cost of Barsingsar and Bithnok are ₹2,635 crore and ₹2,710 crore, respectively.

Now, after seeing it can procure wind and solar power cheaper, the BJP-run government of Rajasthan wanted to renegotiate the agreement.

Solar industry fears Punjab PPA renegotiation - Financial Express, Nov 02, 2021

As FE reported in July, Punjab's former chief minister Captain Amarinder Singh had asked the state's discom to examine all PPAs signed by the erstwhile SAD-BJP government with various private power plants, and revise or cancel the contracts "that are not beneficial to the state".

The state government has also reportedly announced the termination of the PPA with GVK's Goindwal Sahib plant, and is also said to be bringing a legislation in the upcoming state assembly session to rework PPAs with two other private thermal power plants.

Reddy's Andhra Pradesh Government plans to cancel previous green energy contracts – Mint, Jul 04, 2019

Andhra Pradesh government's plan to reopen the power purchase agreements inked under the N. Chandrababu Naidu-led government. According to a Andhra Pradesh government order dated 26 June reviewed by Mint, a Cabinet Sub Committee has been set up to "identify the person/persons/institutions responsible for prima facie mala fide decisions and actions, and recommend appropriate action."

One of the terms of reference of the Cabinet Sub Committee that has spread uncertainty in the India clean energy space is to "Review all investments in power sector and infrastructure projects approved and Power Purchase Agreements (PPAs) executed during this period and recommend appropriate action in case of omissions, commissions, mala fide actions, loss of valuable public resources."

After Andhra Pradesh, it's Uttar Pradesh's turn to flout renewable PPAs – Financial Express, 03 Oct,, 2019

Neither the Centre's admonitions, nor adverse court rulings seem to be dissuading some state governments from dishonouring the power purchase agreements (PPAs) with renewable power units — a trend that is threatening to put the sunrise sector in jeopardy. Close on the heels of the Andhra Pradesh government, which virtually called for a downward revision of the tariffs mentioned in the PPAs for 5.2 giga watt of wind and solar power capacity, the Uttar Pradesh government stopped procuring electricity from 650 mega watt of wind power plants effective Tuesday evening.

The UP government's excuse for the sudden move is the Rs 3.46-per-unit PPA tariff has not been approved by the Central Electricity Regulatory Commission (CERC). But the tariff under PPA for wind units supplying to UP is 7% lower than the average power purchase rate of the state and also much lower than the Rs 4.16-6.02-a-unit rate states paid to wind power plants under the erstwhile feed-in-tariff regime.

Proposed market mechanisms

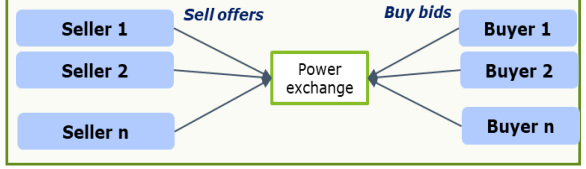
Proposed re-designing of DAM: Market based economic dispatch (MBED) mechanism

Re-designing of day-ahead market would increase depth of short-term markets and provide alternate contracting avenues

Key aspects of MBED

Pooling of buy / sell bids

- Buyers would schedule contracted generation as per extant practice
- All Buyers and all sellers will also submit their bids & offers on day-ahead basis to Power exchange

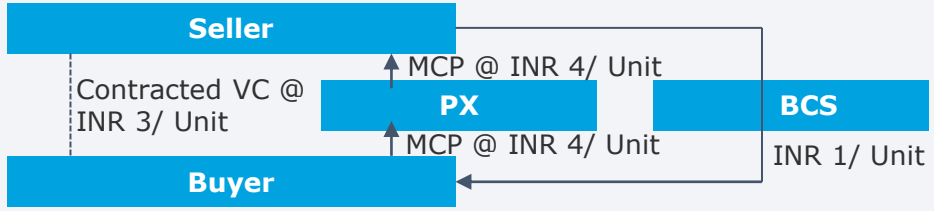


Scheduling and dispatch

- National merit order stack is prepared
- Market Clearing Price (MCP) for each time block is determined
- Cheaper plants dispatched to maximum extent and costlier plants run optimally

Payment and settlement

Buyers pay MCP to Power exchange; in turn pays MCP to sellers



Final settlement between buyer-seller duo would be as per contract for the portion of demand cleared in relation to Day-ahead schedule

Settlement through an instrument called BCS (similar to CfD)

Buyers would continue to pay the fixed charges outside the market

Key benefits of the proposed re-designed Day ahead market

Distribution companies	• Increases utilization of low-cost generators while reducing and backing down expensive ones • Reduces overall power procurement cost due to pooling of buy and sell quantum and national level merit order dispatch
Generators	• Increases utilization of cheaper and efficient plants
Others	• Enhanced RE integration due to enlargement of control area from state to national level • Improved assessment of demand for reserves (Ancillary Services) • Reduced dependence on imports and increased energy security

Other changes to Procurement Mechanisms

01

Ministry of Power has issued guidelines which allow distribution utilities to exit from PPAs after completion of PPA tenure (25 years or period specified in PPA) and corresponding generators have the freedom to sell in any mode

02

Ministry of Power has also issued a scheme which allows for flexibility in generation and scheduling of Thermal/ Hydro power stations through bundling with renewables withing the existing contracted capacity

Resource adequacy frameworks are also being proposed

Alternate revenue streams will help supplement revenues from energy markets while avoiding the risks of long-term locked positions

01

Understanding optimal level of capacity required

- Understand load patterns & diversity amongst states
- Setting RA target levels w.r.t. coincident peak demand and an appropriate reserve margin

02

Forward / Commitment period

- **Timeframe before delivery** that contracting should be carried out
- **Tenure** for which the capacities would be signed up

03

Procurement mode

- **Decentralized mode**: Utilities could undertake contracting through competitive bidding
- Explore possibility of **corrective centralized auctions** for catering to shortfall / surpluses

04

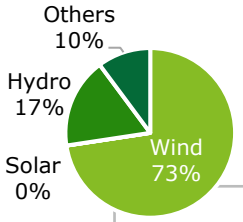
Compliance and corrections for deficiencies

- Enforcement of RA targets at central level
- Mechanism to correct deficiencies and levy penalties for shortfalls

Evolution of RE sector in India

Sector has witnessed an incredible evolution in the last two decades

Pre 2010: 14 GW



Avail tax breaks

Sector updates: Competitive bidding introduced

Tariff: Wind ~4/kWh, Solar > 15/kWh

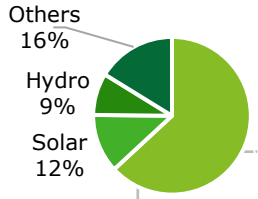
Business driver: Tax incentives

Technology: Wind

Development model: Turnkey

Players: HNIs, corporates

2010 – 2013: 14 GW



Ensure stable IRR

Sector updates: Final incentives such as VGF, GBI bundling of schemes

Tariff: Wind 4-5/kWh, Solar 8-12/kWh

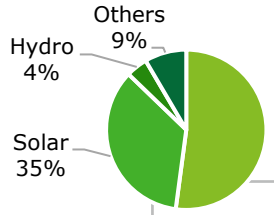
Business driver: GBI and tax incentives

Technology: Wind and solar in nascent stage

Development model: Turnkey, advent of self development

Players: REIPPs, HNIs

2014 – 2016: 15 GW



Scale-up & diversify

Sector updates: Solar parks introduced to address concerns over availability of land

Tariff: Wind >5/kWh, Solar 5-8/kWh

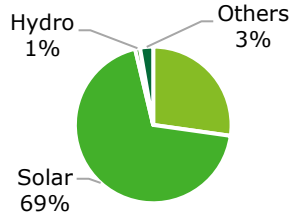
Business driver: GBI, decline in module prices

Technology: Solar & wind

Development model: Self development, turnkey, acquisition/ stake sale

Players: RE IPPs (transitioning from pure play wind to solar), financial investors,

2017 – 2021: 44 GW



Max out capacity

Sector updates: Introduction of ISTS bids and steps towards RE integration

Tariff: Wind 2.5-3.5/kWh, Solar 2-3/kWh

Business driver: 175 GW targets, large bids

Technology: Solar dominating wind

Development model: Self development, acquisition / stake sale

Players: RE IPPs, solar focused IPPs, global RE IPPs, international long term investors

Challenges in way forward, preventing RE addition

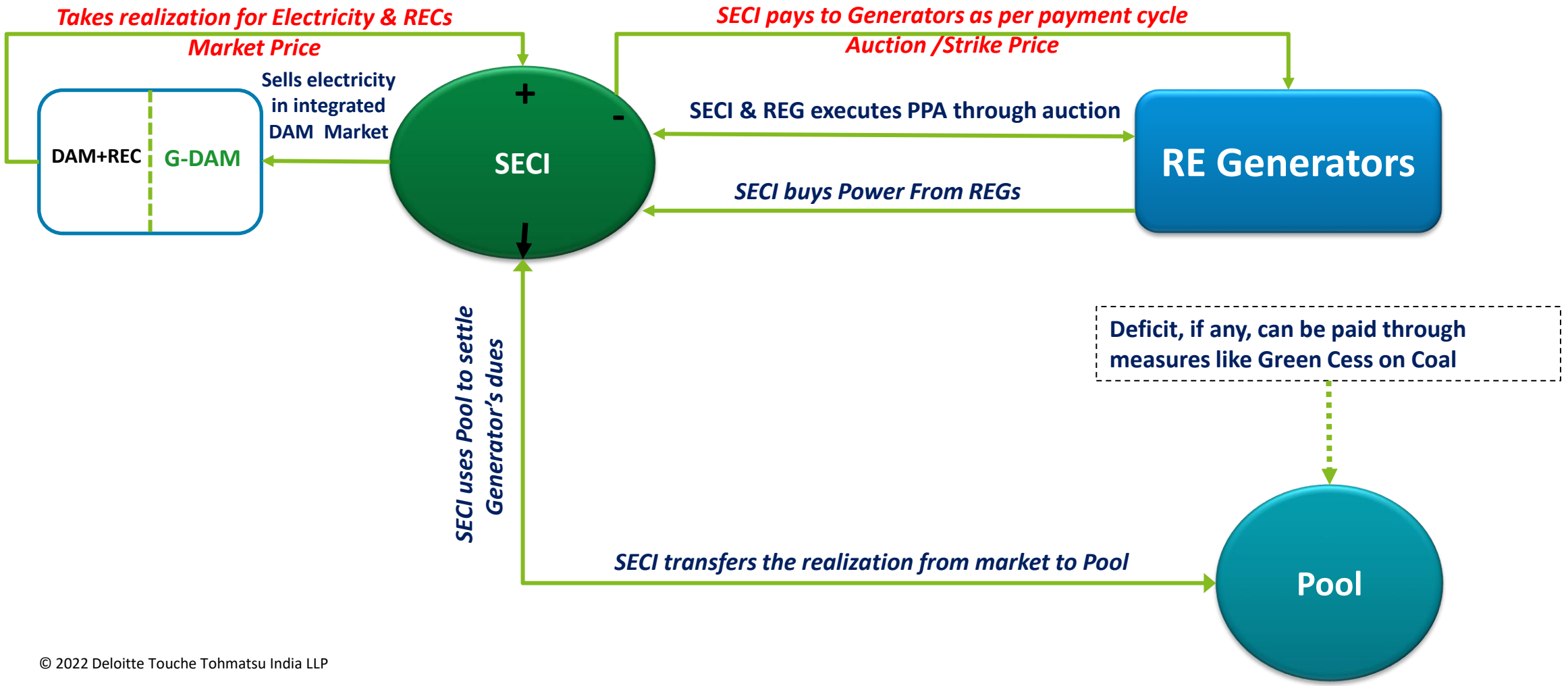
1. Average of y-o-y 50 GW addition req
2. Non-dispatchable resource
3. Financial distress of Discoms
4. Commercial lenders long for security
5. PPA tenure = 25 years

Source: MNRE, CEA Reports, Bid Results, News Articles, Deloitte Analysis

Adopting CFD model for RE addition in India

- SECI executes PPA with Generators.
- SECI buys Power from REG & sells in market.

- SECI gets RECs & Sells in Market.
- SECI owns the responsibility to fund Pool deficit, if any & settlement of payment with Generators.



Road to large-scale RE integration

Transition from PPA to market based mechanism for new capacity addition

Introduce RE on exchange

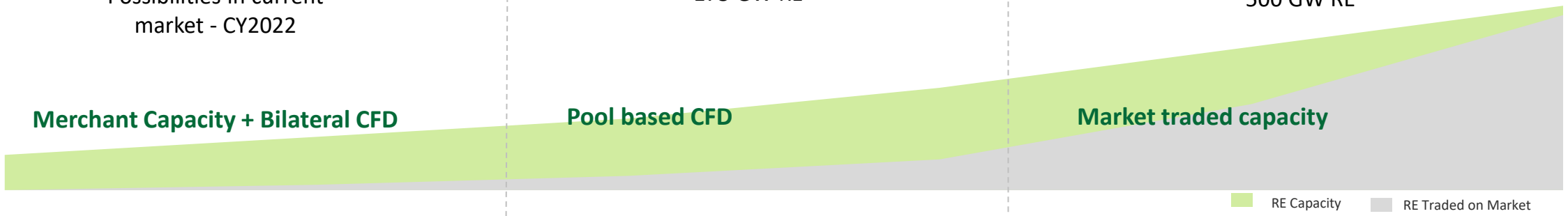
Possibilities in current market - CY2022

Enhance RE share in market

175 GW RE

Entire RE on markets

500 GW RE



- 50% capacity under PPA +50% capacity exchange traded, protected through **bilateral CFD**

- Portion of RE capacity traded through exchange on merchant basis, remaning protected by **Pool based CFD**

- Entire RE treated as dispatchable without market safeguards

Contractual Protection → Scheduling Safeguards → Market participation

Enabling RE participation in Day-ahead markets

Benefits of market participation of RE power with revenue protection

Generators

- Revenue protected through CFD in the near term till generators gain confidence in the market
- Deepening of markets and availability of various products, allows generators to focus on innovation
- Payment security, improves cash position which may translate into competitive pricing in market
- Upside potential for higher earnings on merchant basis from power markets

Discom/ Consumers

- Increase in liquidity in market would ensure Discoms realize the most optimized procurement cost
- Participation in market, would make RE more schedulable for Discoms, lowering RE integration costs
- Better participation in auctions, as generators start realizing benefits of setting up merchant capacity along with tied-up capacity

Lenders

- CFD protects project returns
- Margin money requirement to participate in market improves the risk profiles of the projects
- Wider participation of RE in market, disperses the myth around viability of adding and integrating large volumes of RE in the grid, thereby sending a positive signal to the investors

Thank you.