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Corporate renewable market overview

18 January 2024



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Agenda

- 10:00 – 10:30** Keynote address by State Nodal Agency
- 10:30 – 11:00** Presentation by BRIDGE TO INDIA team
- 11:00 – 11:15** Networking break
- 11:15 – 12:30** Open access power
- 12:30 – 1:30** Rooftop solar
- 1:30 – 2:15** Lunch
- 2:15 – 3:30** VPPAs, RECs and green power exchange
- 3:30 – 3:45** Networking break
- 3:45 – 4:30** Renewable Energy Demand Enhancement (REDE)
- 4:30 – 5:45** Interactive session with consumers

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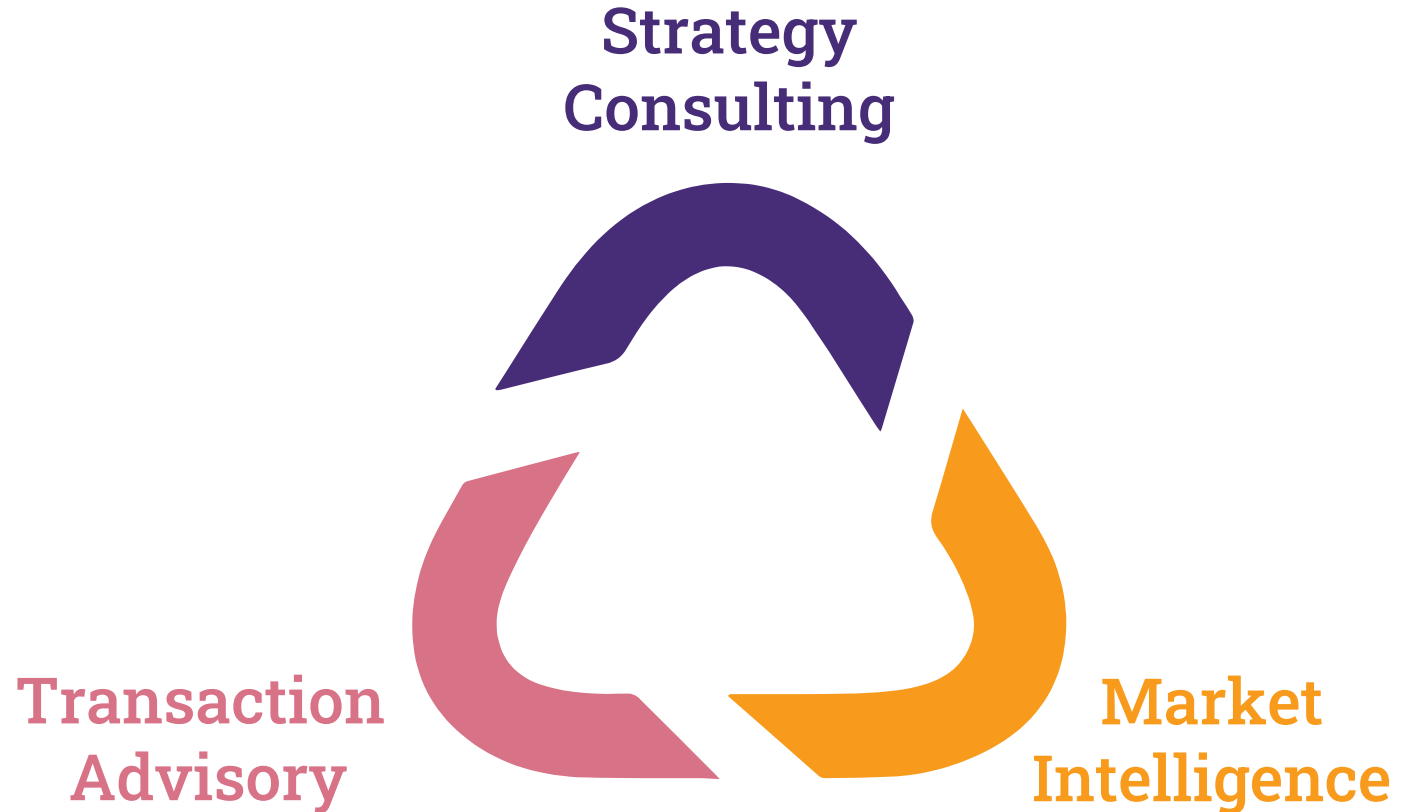
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CRISIL's majority stakeholder is **S&P Global**

- World's foremost provider of independent credit ratings, indices, risk evaluation, investment research, data and valuations
- Presence in **11** countries with over **3,700** employees



BRIDGE TO INDIA is a clean energy-focused consulting and research services company



Deep sector insights

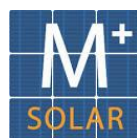
A 360 degree view of market dynamics

An unrivalled network of industry stake holders

Cross-functional team

We work with clients across the sector

Select clientele



We have built strong expertise in the corporate renewable market

Select consulting assignments



Renewable power roadmap

Logistics company

Evaluation of various renewable power procurement options; policy and financial feasibility



Policy advocacy

Global technology major

Renewable sector policy and market analysis for select states; preparation of policy advocacy briefs



RE 100 roadmap

Power electronics manufacturer

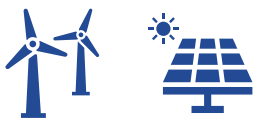
Development of RE100 roadmap; detailed policy and cost analysis of different procurement options



Market sizing

Leading C&I developers

Detailed assessment of C&I renewable market including market sizing and growth prospects



RE 100 roadmap

Automobile manufacturer

Development of an RE100 roadmap for manufacturing facilities in multiple states



Policy advocacy

International think tank

Development of an RE100 roadmap for manufacturing facilities in multiple states



RE procurement

Industrial consumer

Operational and financial feasibility assessment of a 10 MW rooftop solar plant for an industrial consumer



Transaction advisory

Multiple international PE firms

Commercial and market due diligence for investment in renewable project developers

We have built strong expertise in the corporate renewable market

Select research assignments

INDIA CORPORATE RENEWABLE BRIEF Q1 2023

Contents

- 1 Capacity addition | 1
- 2 Pricing update | 3
- 3 Policy developments | 6
- 4 Other market developments | 15

Executive summary

India added 1,635 MW corporate renewable capacity in Q1 2023, up 50% QOQ and the highest since Q1 2018. Total corporate renewable capacity is estimated to have reached 30,098 MW with OA solar, wind and rooftop solar capacity estimated at 9,856 MW, 10,605 MW and 9,637 MW respectively.

Figure: Total corporate renewable capacity by March 2023.

Source: BRIDGE TO INDIA research
Note: OA wind capacity includes 2.7 GW projects allocated originally under FIT regime in Maharashtra for which PPAs have expired and not been renewed.

The increase in quarterly capacity addition came despite module availability constraints partly because of the rush to complete projects before end of the financial year.

This report provides an update on key trends and developments in the C&I renewable market including capacity addition, key players, policy issuances, financing, equipment prices and other market trends in the last quarter.

INDIA CORPORATE RENEWABLE MARKET 2023

Inter-state OA – opportunities and challenges
December 2023

Contents

- 1 Introduction | 3
- 2 Alternate project configurations | 4
- 3 Drivers | 5
- 4 Challenges | 7
- 5 Approval process | 7
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Executive summary

Inter-state transmission system (ISTS) open access (OA) renewable market is gaining strength on the back of multiple drivers including a waiver from ISTS charges together with decarbonisation pressure on corporates and abandoned transmission connectivity approval process. However, the ISTS route savings are viable only for projects commissioned by June 2026 (at least 75% ISTS charge waiver). Other challenges include lack of banking facility and inadequate transmission infrastructure.

Figure: Landed cost of power for industrial consumers, INR/ kWh

Source: BRIDGE TO INDIA research
Note: Landed cost is shown inclusive of applicable grid charges for a 33kV transmission line. ISTS-connected consumer procuring hybrid renewable power under group captive model.

We expect total ISTS OA renewable capacity addition of about 11 GW in the next five years with project concentration in Rajasthan, Karnataka, Madhya Pradesh and Gujarat. This report provides an overview of the ISTS OA renewable market, landed cost analysis under alternate project configurations, drivers, challenges, approval process and overall market outlook.

Global Corporate Renewable Power Procurement Models Lessons for India

Accelerating corporate procurement of RENEWABLE ENERGY IN INDIA

Corporate RE procurement – best practices
September 2023

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- 2 Procurement standards | 5
- 3 Significance for Indian consumers | 9
- 4 Conclusion | 10

Executive summary

Corporate consumers have access to multiple avenues to procure renewable power. Availability of various alternative procurement routes and business models has compounded the issue of consumer's lack of awareness regarding industry best practices.

Many international frameworks including RE 100, CDP, Science Based Targets Initiative (SBTi) and GHG Protocol seek to assist corporates in measuring and reporting carbon emissions and/or increasing renewable power penetration. But these frameworks ignore variations in national level policy and regulatory framework as well as market design. Consumers have to assess each procurement to make optimal decisions and prevent claims of greenwashing.

Figure: Renewable power components

This report provides an overview of most commonly used international sustainability frameworks and industry best practices for procurement of renewable power.

RE100 Climate Group | ACDP | A business case for Renewable Energy Certificates for Indian companies to meet RE100 targets

RE100 Climate Group | ACDP | A business case for rationalisation of Green Tariffs in India

How can an impeccable green electricity tariff regime be a Renewable Electricity enabler?

REPORT Facilitating Growth of Corporate Renewable Market
May 2023

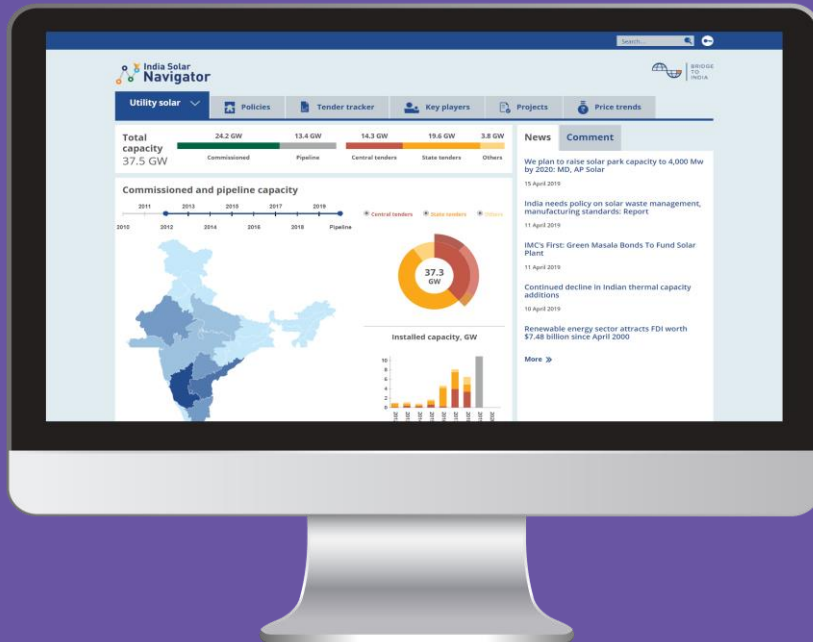


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India RE Navigator

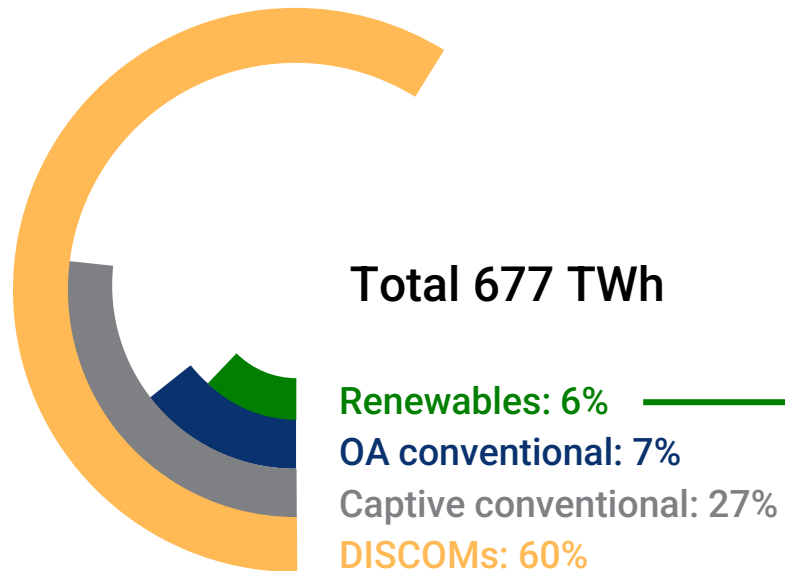
Utility scale solar | Rooftop solar | Wind | Storage | Hydrogen



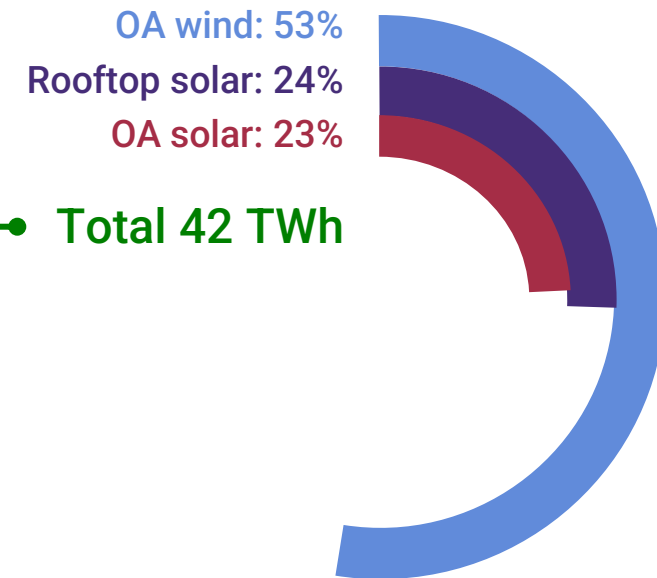
- Tenders
- Projects
- Government policies
- Player profiles
- Prices
- News
- Opinion

The corporate renewable market holds huge growth potential

Corporate power consumption mix, FY 2021



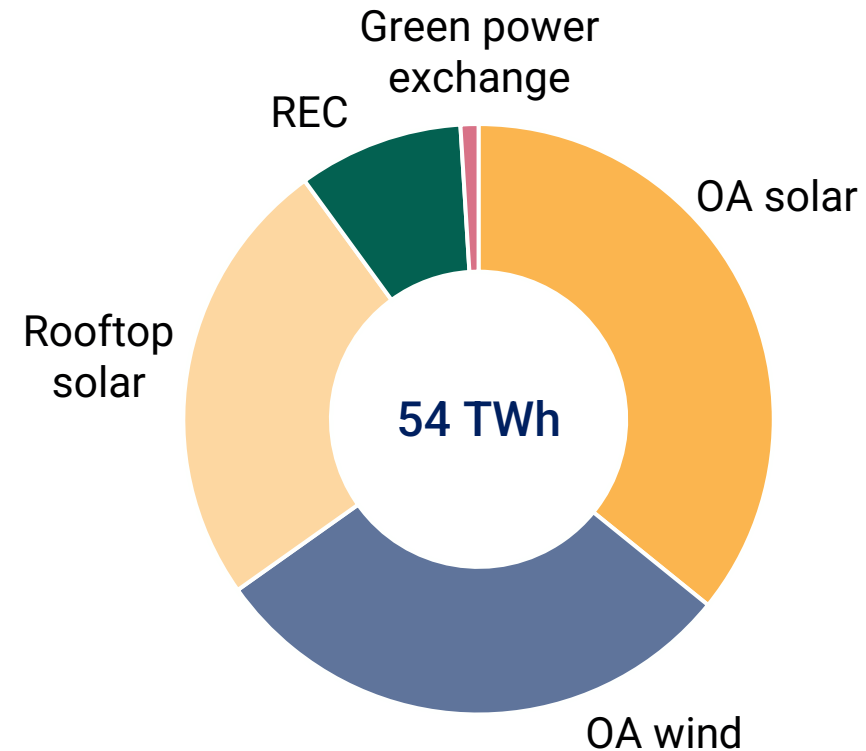
Renewable power procurement



The number of procurement options is increasing

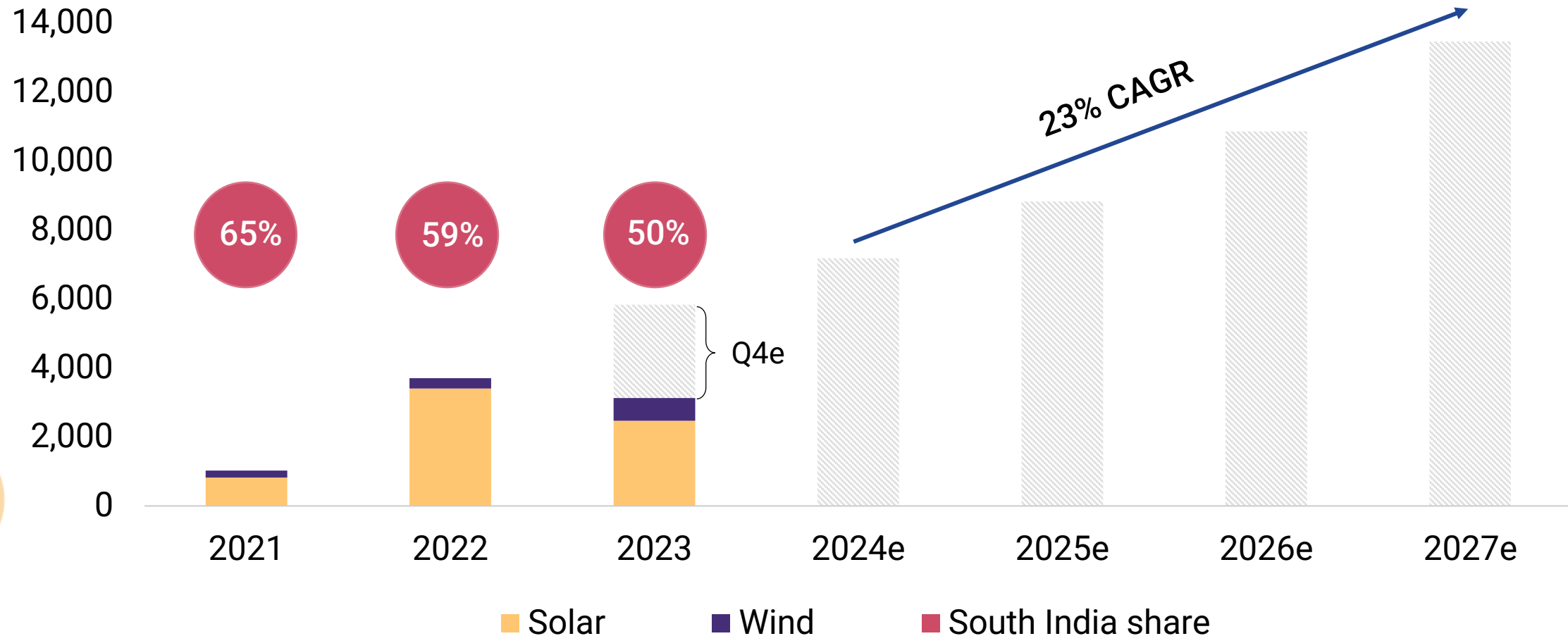
- 1 Rooftop solar
- 2 Open access (OA)
- 3 Green power exchange
- 4 RECs
- 5 VPPAs
- 6 Green tariffs

Indicative market share in 2023



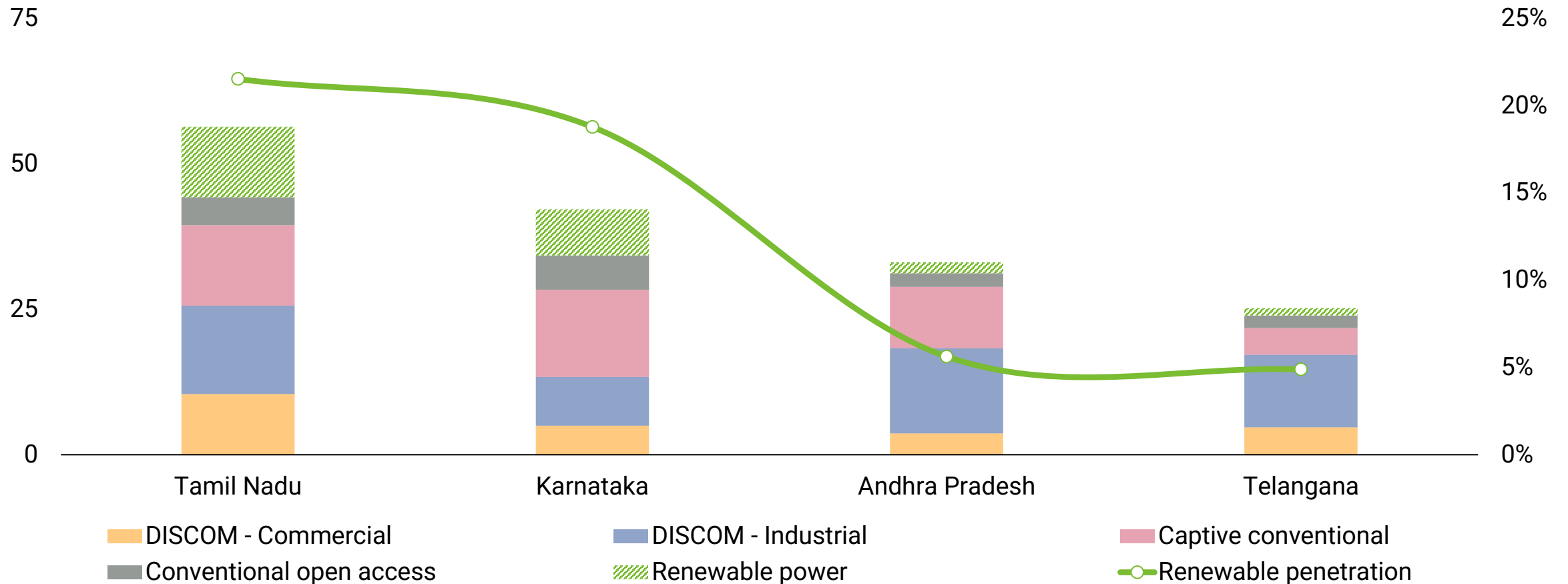
Growth prospects are looking increasingly positive

Corporate renewable capacity addition, MW



The South India market is a tale of two halves

Corporate power procurement in FY 2021, TWh



Key growth drivers

Demand growth

- 43.3% Rising RPO targets
-  Voluntary targets
-  Carbon trading scheme
-  EU Carbon Border Adjustment Mechanism

Supply growth

-  Improving technology
-  Falling costs
-  Supportive regulatory framework
-  Lower cost of financing

The marketplace is becoming more dynamic

Technologies

- Wind-solar hybrid projects
- RTC solutions with integrated storage
- Renewable heating for process heat applications
- Green hydrogen

PPA structures

- Despatchable power from composite supply sources
- Shorter tenors

Business models

- Integrated project development-cum-EPC solutions
- Virtual power purchase agreements (VPPAs)
- Unbundled green attributes – RECs, I-RECs, TIGRs
- Green tariffs
- Group open access

Conclusion

- Growth outlook extremely positive
- Central government policy support encouraging
- More dynamic market with emerging business models, new PPA structures and improving technologies



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Open access power

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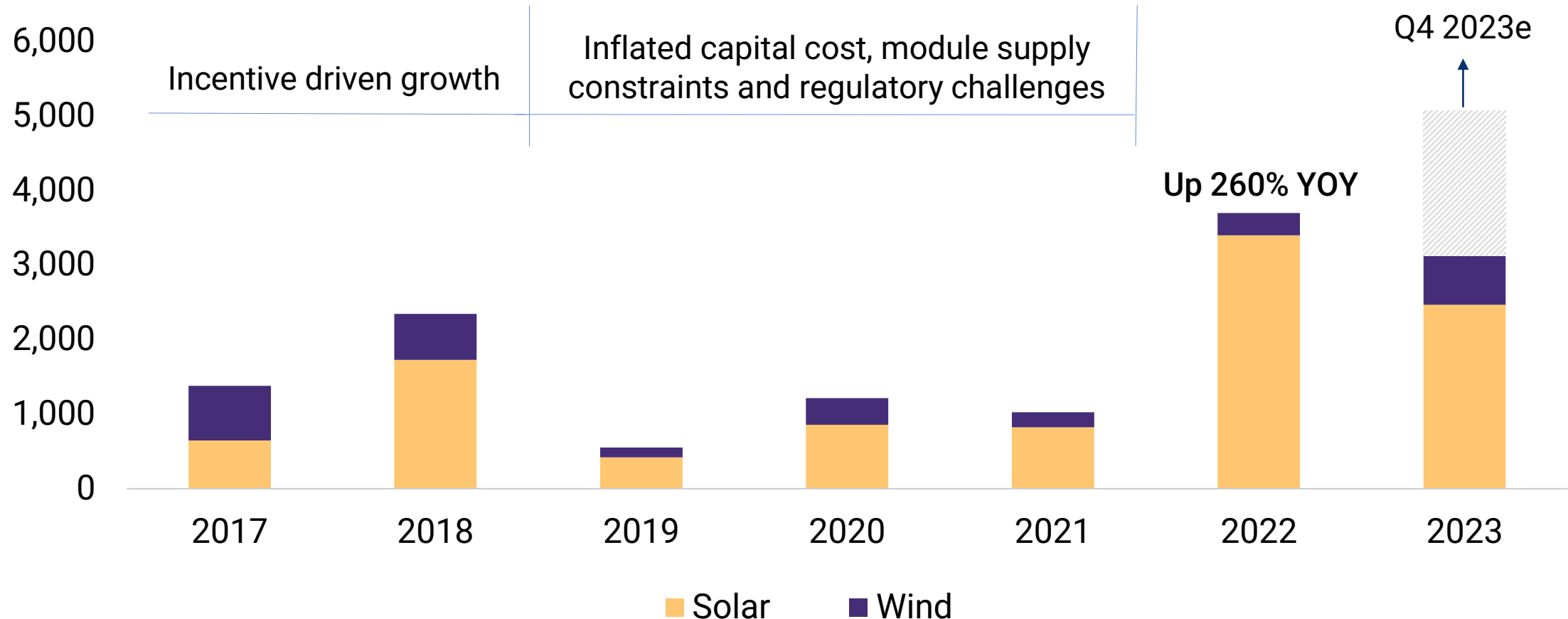


Module and Energy Storage Partner



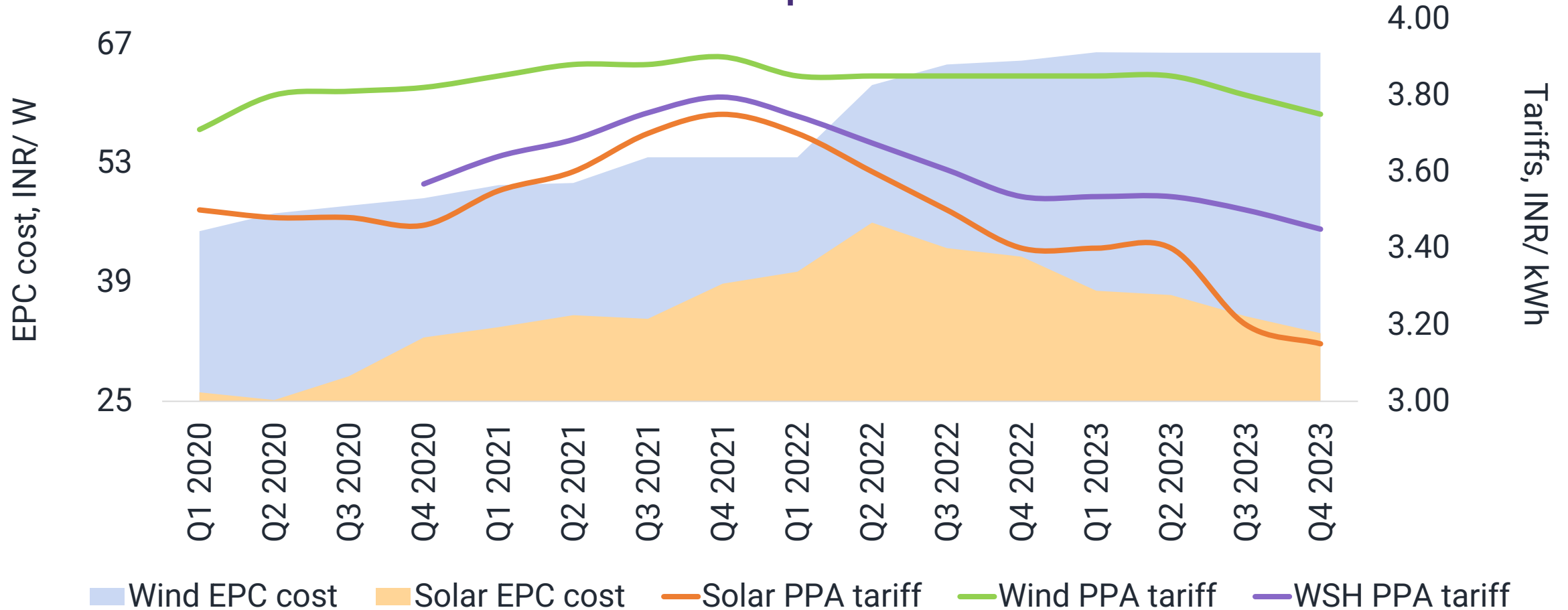
Market growth has picked up sharply in the last 2 years

Capacity addition, MW



Tariffs are on the way down as costs fall

EPC cost and power tariffs



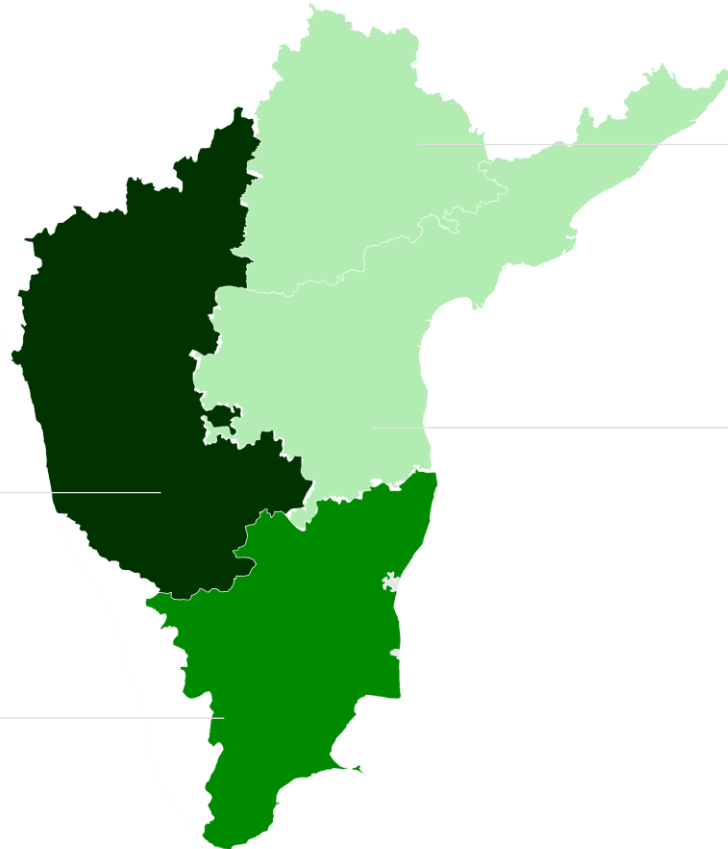
Policy landscape varies significantly across the four states

Karnataka

- Adopted Green OA Rules
- High approval rate
- Decreased energy charges by 2-5%
- Lower energy charge of INR 5.00/ kWh for HT consumers for consumption over contract demand
- Proposed grid support charge of INR 3.01/ kWh for captive projects

Tamil Nadu

- Liberal banking regulation
- High approval rate
- Not adopted Green OA Rules
- Greater scrutiny of group captive projects



Telangana

- Proposed to adopt Green OA Rules
- Low approval rate
- Proposed grid support charge of INR 25,000/ MW/ month

Andhra Pradesh

- Proposed to adopt Green OA Rules
- Low approval rate
- Introduced rebate of INR 0.75/ kWh for consumption in off-peak hours (10 AM to 3 PM)

Demand is increasing for firm-power or RTC solutions



60% solar + 40% wind

RE penetration of up to 60%

Consumers with high day time consumption load

INR 3.80/ kWh



30% solar + 70% wind

RE penetration of up to 80%

Suitable for consumers with a 24*7 consumption load

INR 4.00/ kWh



60% solar + 40% wind + 20% storage

RE penetration of up to 100%

Suitable for consumers with a relatively stable consumption load

INR 5.50/ kWh

Conclusion

- Strong market growth aided by attractive renewable resource and high demand growth
- Policy framework improving steadily
- EPC costs on the way down
- Further drivers include ISTS waiver, new business models and technologies



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Rooftop solar

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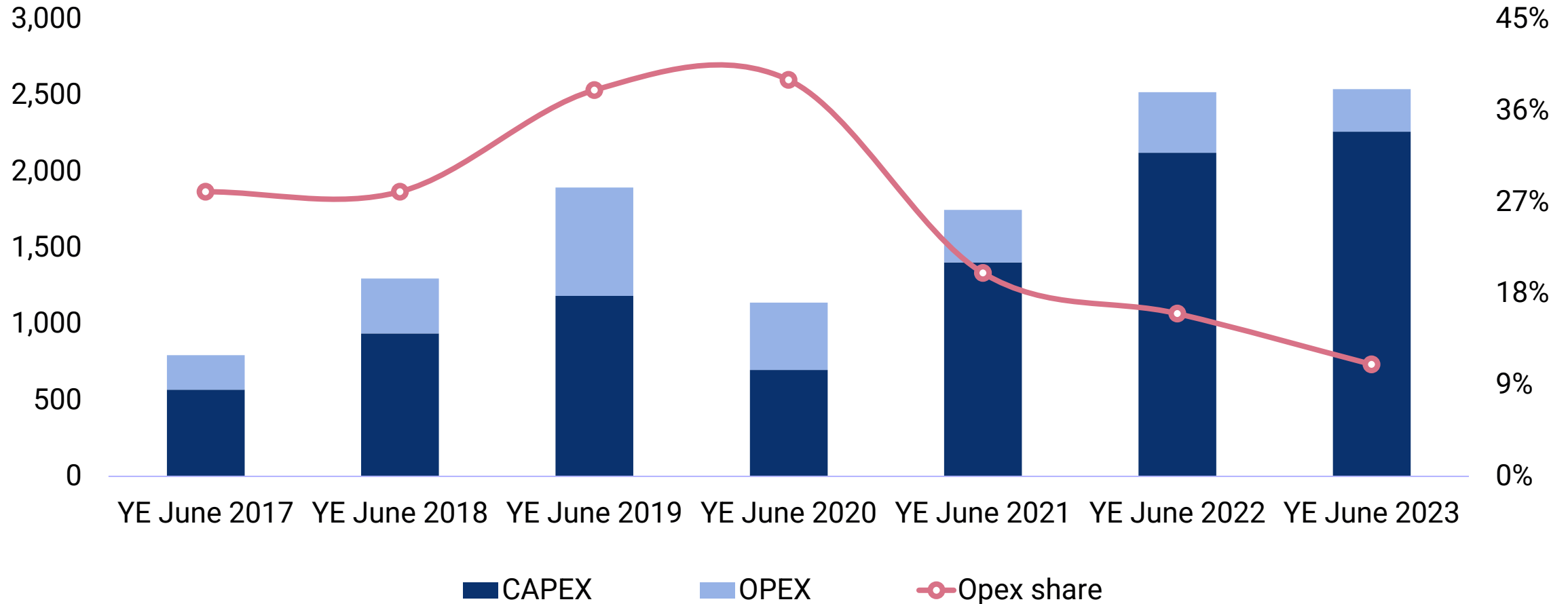


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Capacity addition has stagnated recently

Corporate rooftop solar capacity addition, MW



Relatively liberal rooftop solar regulations

Telangana

- Net metering up to 1 MW
- Half-yearly banking provision from June to December
- Waiver from all grid charges

Andhra Pradesh

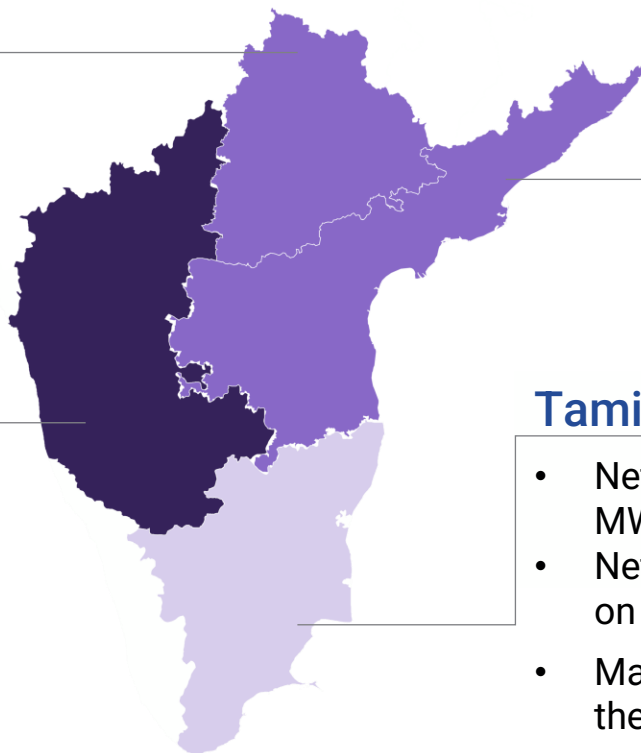
- Net metering with system size limit of 1 MW
- Monthly banking provision with surplus power compensation at APPC
- Waiver from distribution charges and losses

Karnataka

- Net metering up to 2 MW, except for OA and OPEX model customers
- Monthly banking with surplus power compensation at INR 3.19/ kWh

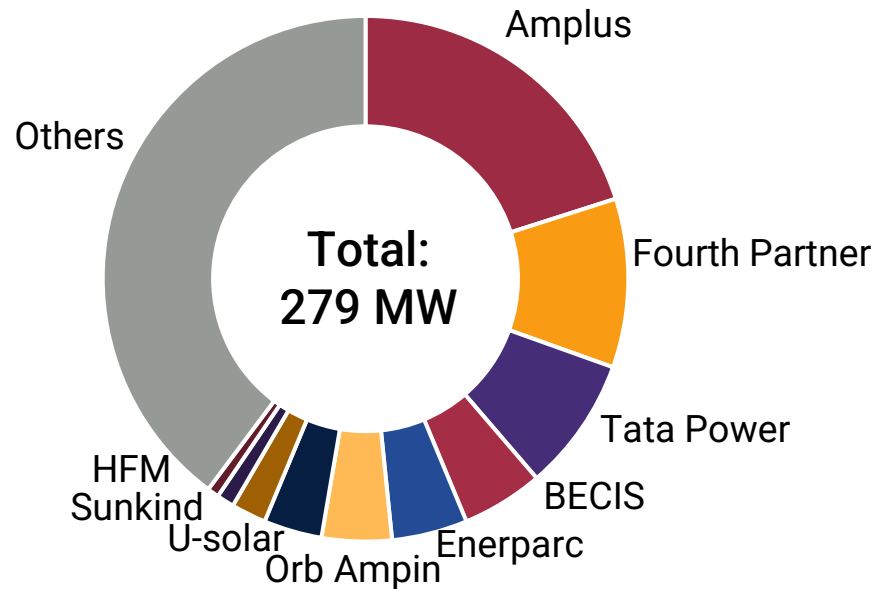
Tamil Nadu

- Net billing with system size limit of 1 MW
- Network charges of INR 0.83-1.27/ kWh on projects under net billing
- Market has completely shifted to behind-the-meter systems

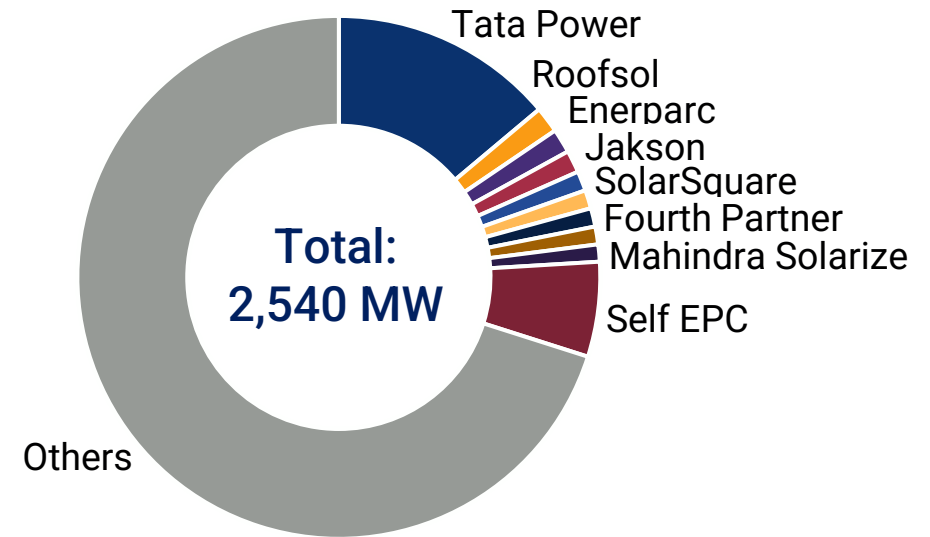


Supply side eco-system is highly fragmented

Project developers
YE June 2023, MW



EPC contractors
YE June 2023, MW



Technical improvements are driving project efficiency up

- Improvements in inverter technology
- Advanced software for plant design and simulation, and study of shading effects
- Choice of mounting structures for different roof types based on dynamic loading analysis
- AI and ML-based performance monitoring and predictive maintenance
- Robotic cleaning

Conclusion

- Most attractive option despite regulatory challenges
- BTM systems highly popular
- Alternative models like virtual and group net metering yet to be tested



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VPPAs, RECs and green power exchange

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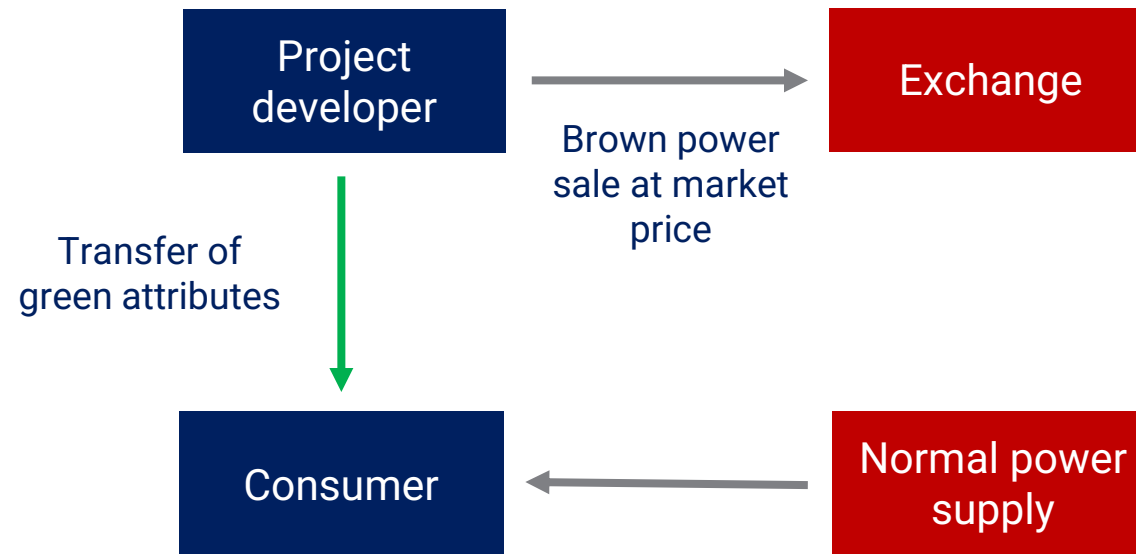
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Modified VPPAs are becoming more popular



RECs are a relatively simple procurement option, but high cost and lack of policy stability are key challenges

Advantages



No capex requirement



No day-to-day operational hassle or monitoring



No long-term purchase commitment



Traceable and unique green attributes



No eligibility constraints

Risks and challenges



Limited supply



Low price visibility

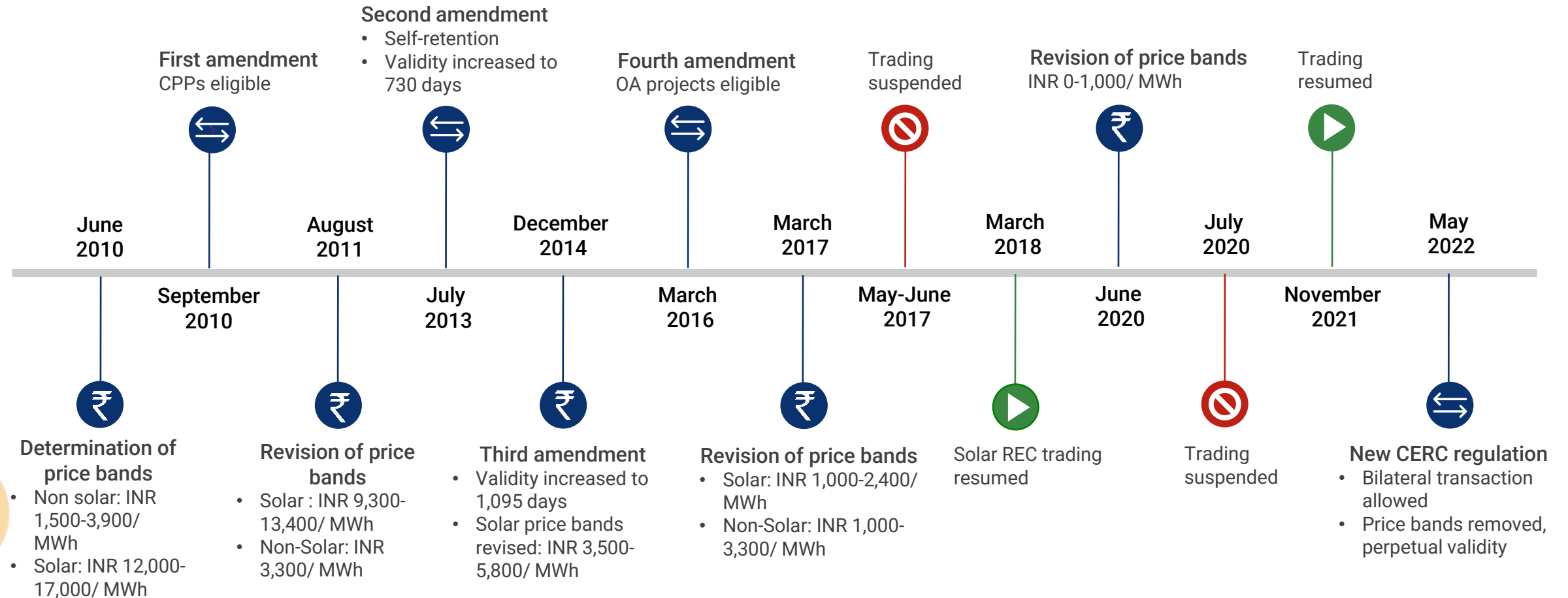


Cost over and above existing procurement price



Regulatory uncertainty and recurring legal disputes

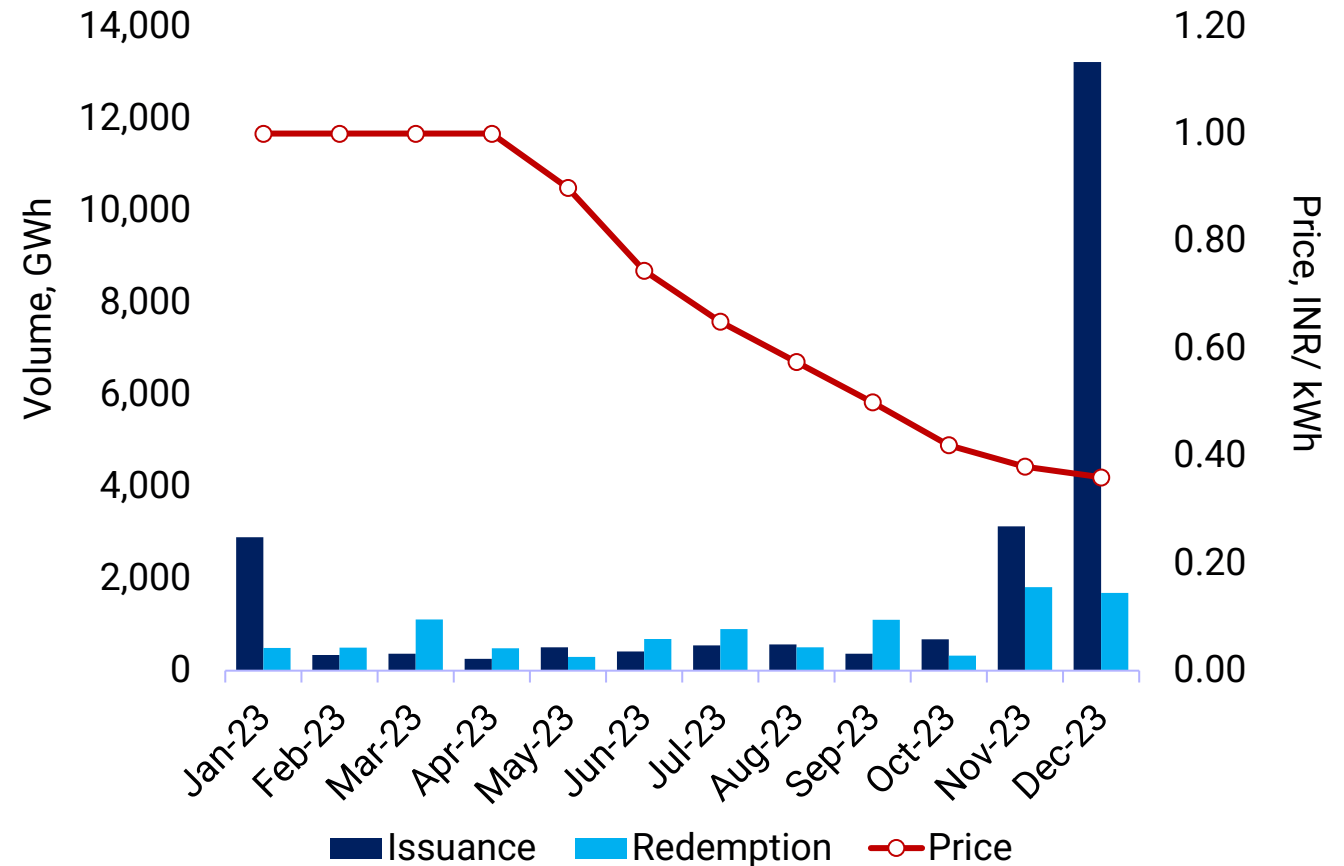
The REC scheme has been prone to frequent regulatory changes and disputes



Recent reforms are expected to trigger growth

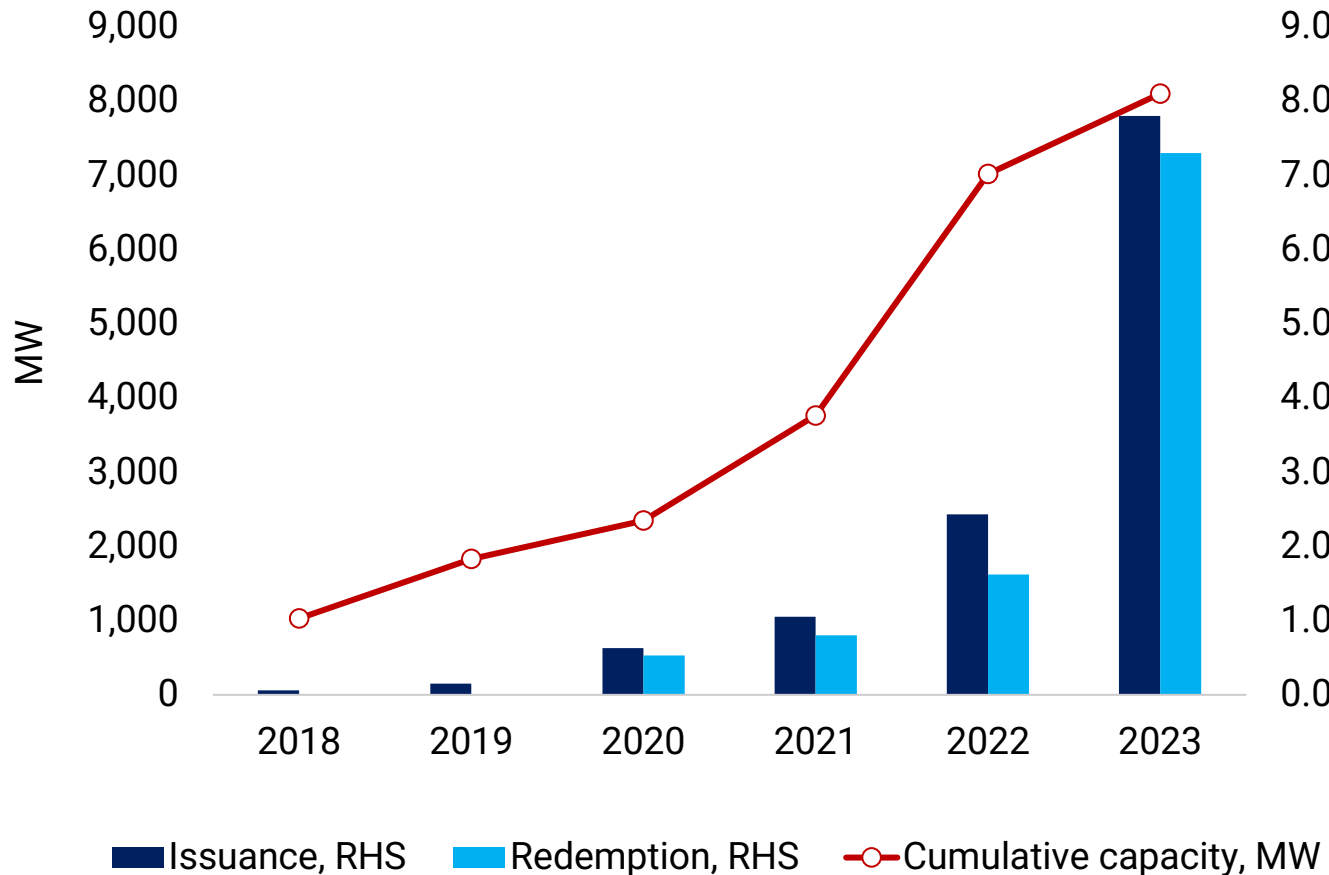
- Tradeable on exchanges and bilaterally
- Market determined prices
- Unlimited validity
- Obligated entities eligible for RECs in case of RPO over-compliance
- 1.5-2.5x multipliers for hydro, waste-to-power, bioenergy sectors

REC issuance and redemption in 2023



Indian I-REC market has also picked up recently

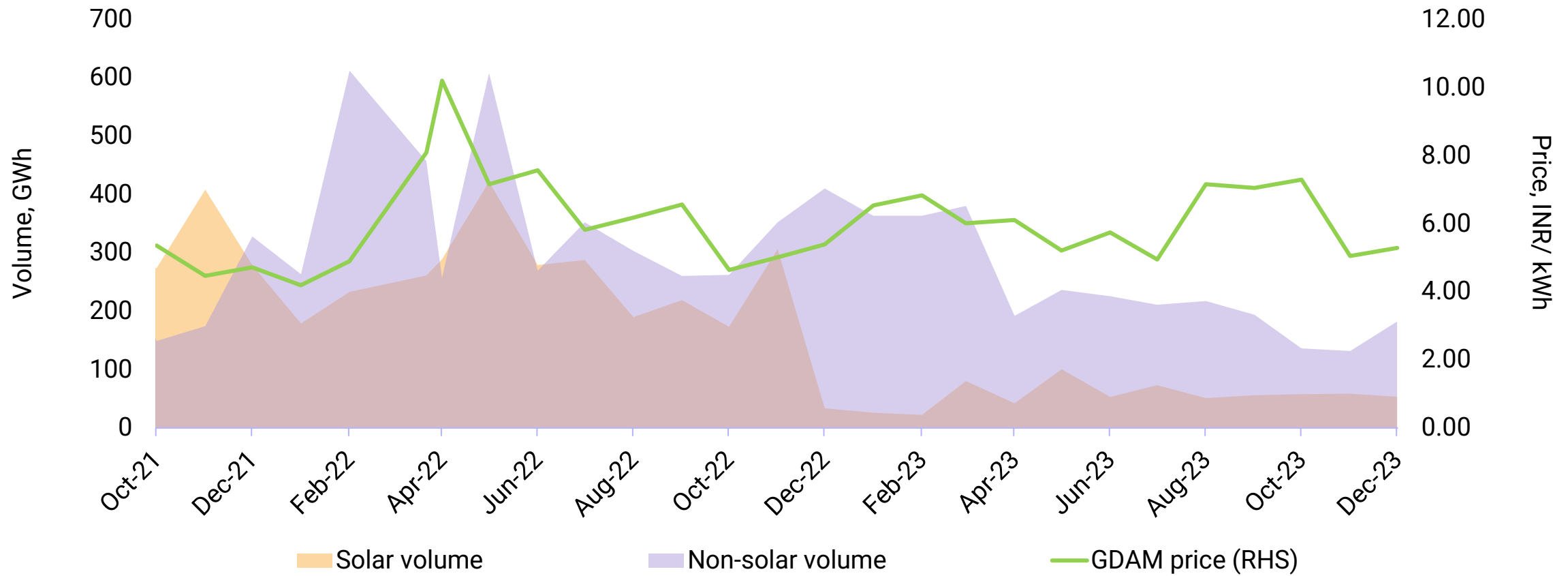
Indian I-REC market



- Optimal solution for consumers with voluntary targets
- Suitable for companies with fragmented operations
- Ineligible for RPO compliance
- No price transparency, traded bilaterally at about USD 1.00/ MWh

Green power trades on the exchange are limited by high cost and low volumes

Green power exchange volume and prices



Conclusion

- Alternative solutions growing for specific use cases
- Usually unattractive for bulk consumption; used tactically to meet shortfall in annual targets