

Market for Renewable Energy

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In this Presentation

- Renewable Scenario in India
 - Renewable @ IEX
 - ✓ Renewable Energy Certificates
 - ✓ Day Ahead Market
 - ✓ Green Day Ahead Market
 - Markets *for* RE Integration
 - About IEX
-



RENEWABLE SCENARIO

Options for RE Generators (Sellers)

Bundled

- Discom
 - Feed-in-Tariffs (FIT)
 - Competitive Bidding
- Third Party Sale to consumers

Proposed
Green Market @ Exchange

Unbundled

- To Discom @APPC
- Third Party sale to consumers
- Sell at Exchange
- Captive Consumption



Sell REC @ IEX

RPO Compliance is the key challenge (RPO Compliance, FY17-18- till Sep)

States	Compliance Status
Himachal Pradesh, Meghalaya, Karnataka, MP, Tamilnadu, Mizoram, AP, Rajasthan, Punjab	Above 100%
Lakshadweep, Maharashtra, Uttarakhand, Kerala	60-100%
Chattisgarh, Westbengal, Tripura, J&k, Odisha, Uttarakhand, UP, Haryana, Delhi, Manipur, Goa	Less than 60%



RENEWABLE @ IEX

RENEWABLE ENERGY CERTIFICATES

DAY AHEAD MARKET

GREEN DAY AHEAD MARKET

IEX Market Segments - *Delivery-based Contracts*

Day-Ahead Market

since June,08

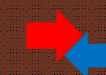
- Delivery for next day
- Price discovery: Closed , Double-sided Auction



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



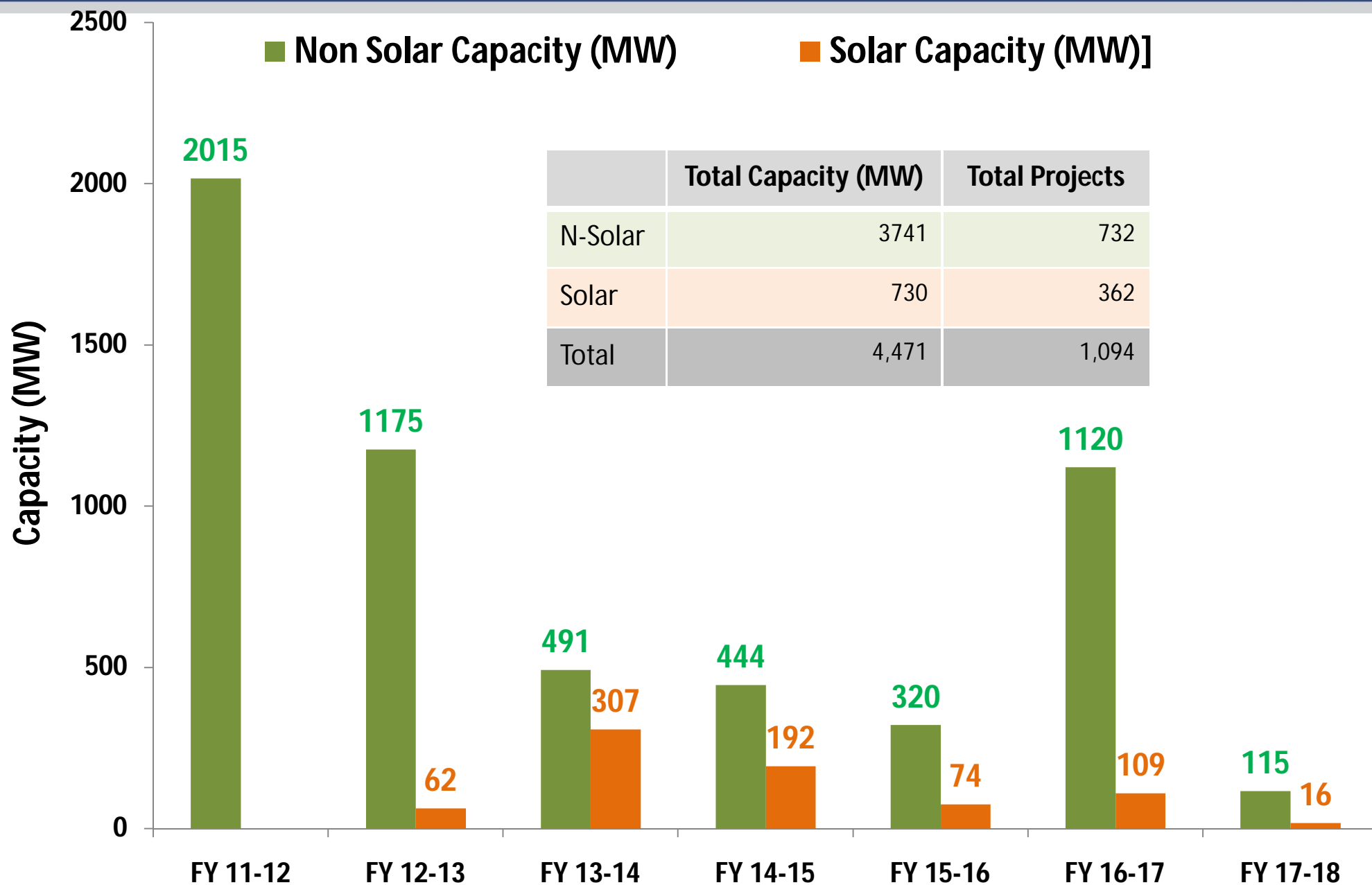
Energy Saving Certificates (Since 26 Sep'17)

- 1 EScert= 1 Mtoe(Metric Tonne Oil Equivalent)
- Trading Session on every Tuesday of the Week
- Trading time :1300 hrs to 1500 hrs



**In India, all electricity contracts at the Exchange are for physical delivery
No derivatives or contracts with delivery over 11 days available**

New REC Projects Registration Trend



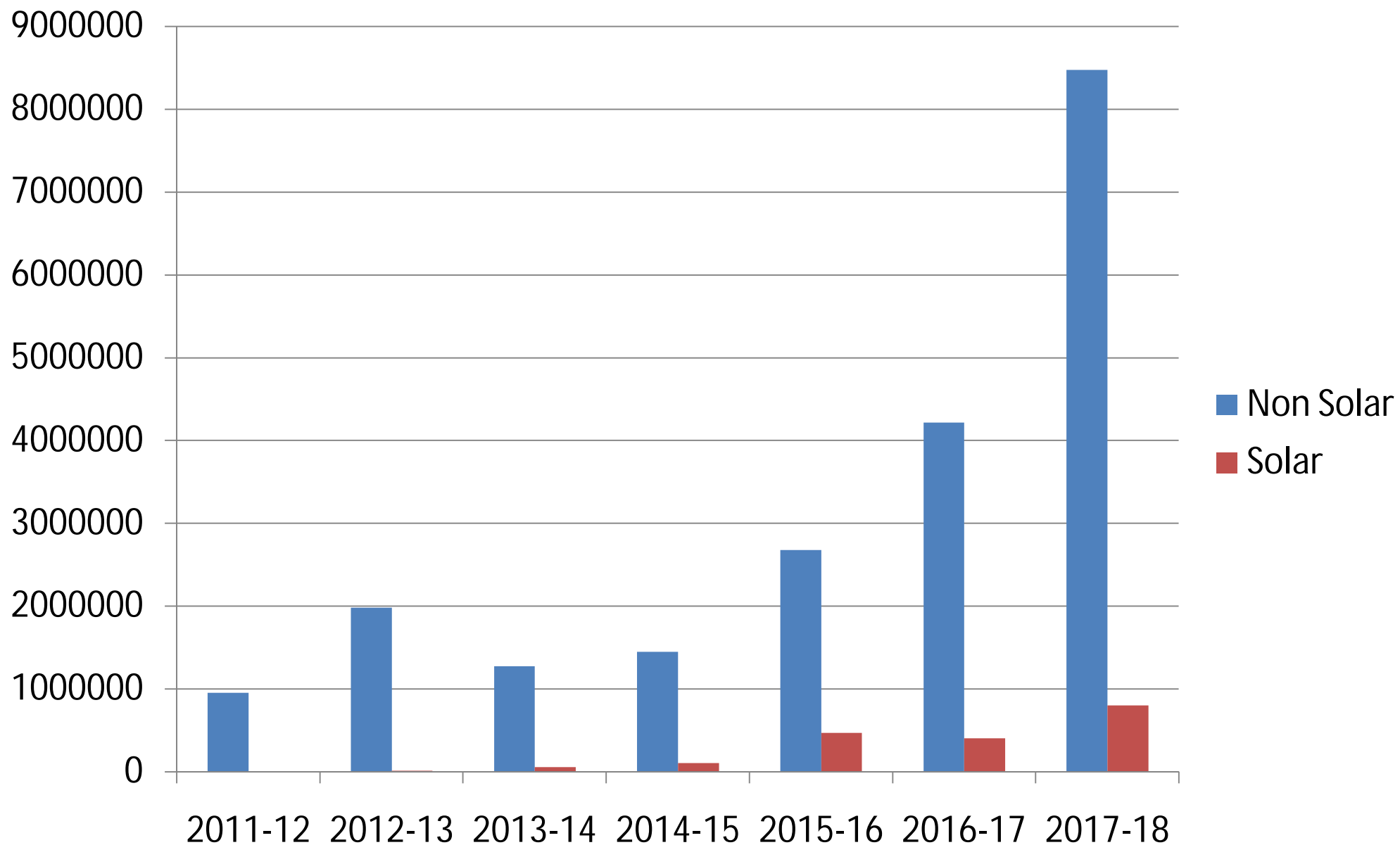
	Total Capacity (MW)	Total Projects
N-Solar	3741	732
Solar	730	362
Total	4,471	1,094

An update on RECs

	Accredited Capacity (MW)	Registered Capacity (MW)	No. of Projects Registered	No of RECs (in Cr)			
				Issued	Traded	Self Retained	Inventory
Non -Solar	4,842	3,735	730	3.72	2.90	0.12	0.67
Solar	747	733	360	0.74	0.16	0.005	0.57
Total	5,565	4,471	1,094	4.47	3.06	0.13	1.25

As on 31st December 2017

REC Volume Cleared





RENEWABLE @ IEX

*RENEWABLE ENERGY
CERTIFICATES*

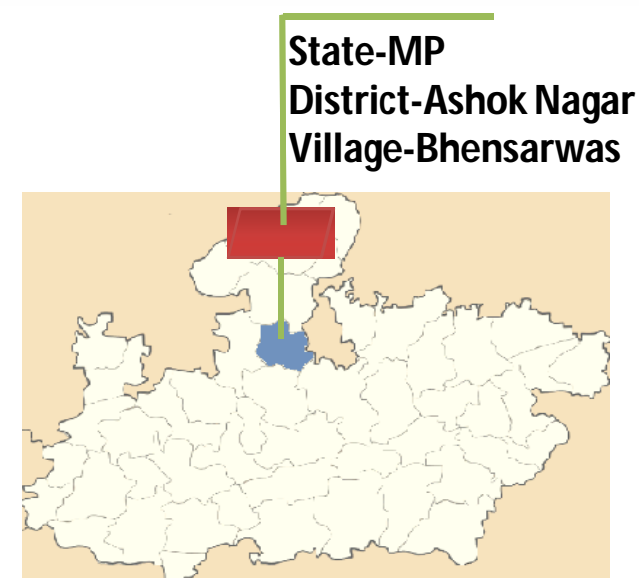
DAY AHEAD MARKET

GREEN DAY AHEAD MARKET

FIRST SOLAR POWER PLANT IN DAY-AHEAD MARKET

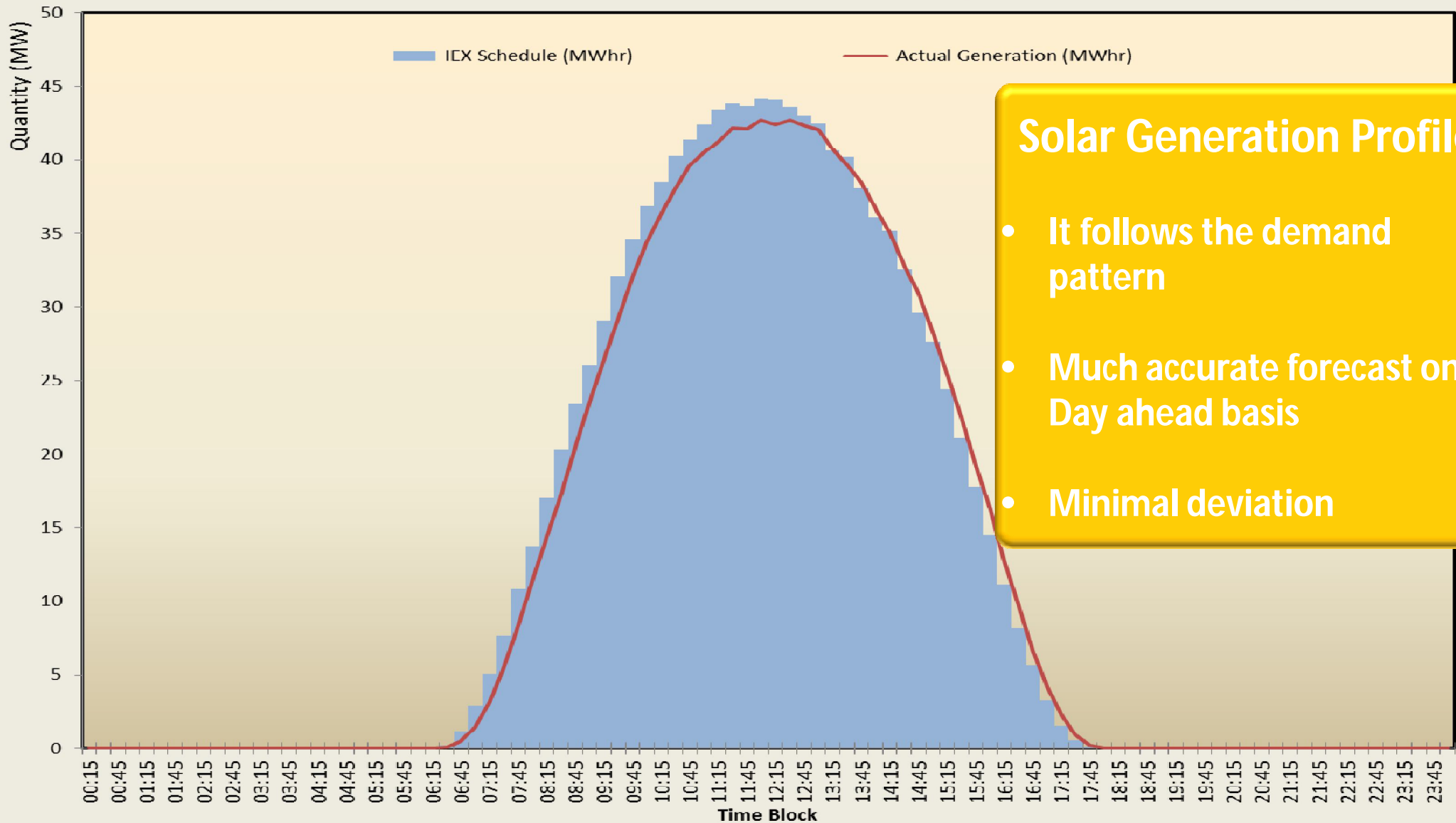
- ✓ Plant Name-Renew Clean Energy Pvt. Ltd. ,
- ✓ Plant Capacity-51 MW
- ✓ Developer-Renew Power Ltd.
- ✓ Started trading @IEX : 7th Oct
- ✓ Price @ IEX - Rs. 3.80/u
 - Post losses & charges Rs 3.48
 - Post Deviation Charges Rs 3.43
- ✓ Additional Benefit of Renewable Energy Certificates
- ✓ Peak day-time sale

*Assessment Period- 7th Oct'17 to 30th Nov'17



DAY Ahead Market best suited for Solar

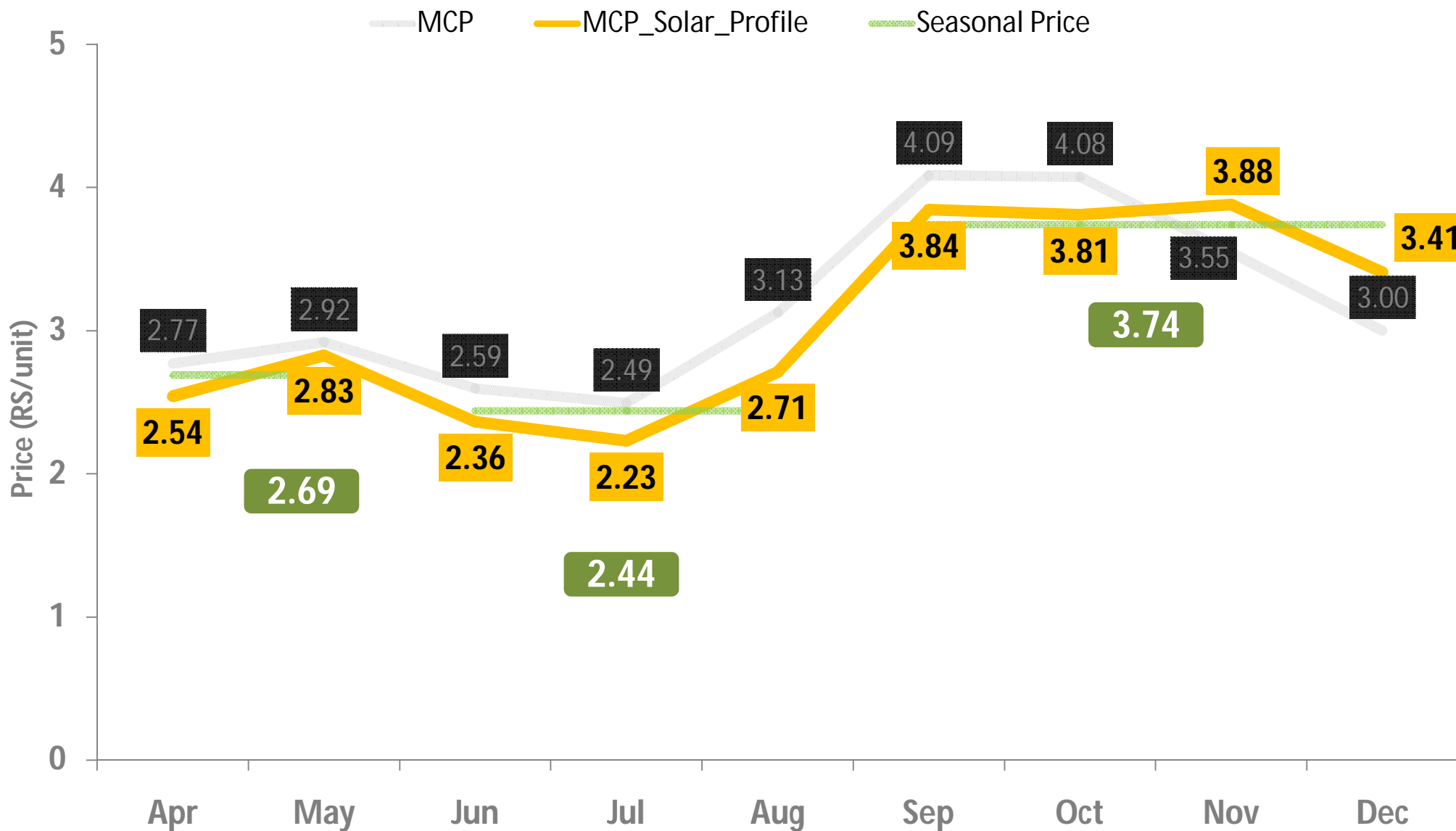
Average Schedule and Actual Generation Profile (7th Oct to 30th Nov)



Solar Generation Profile

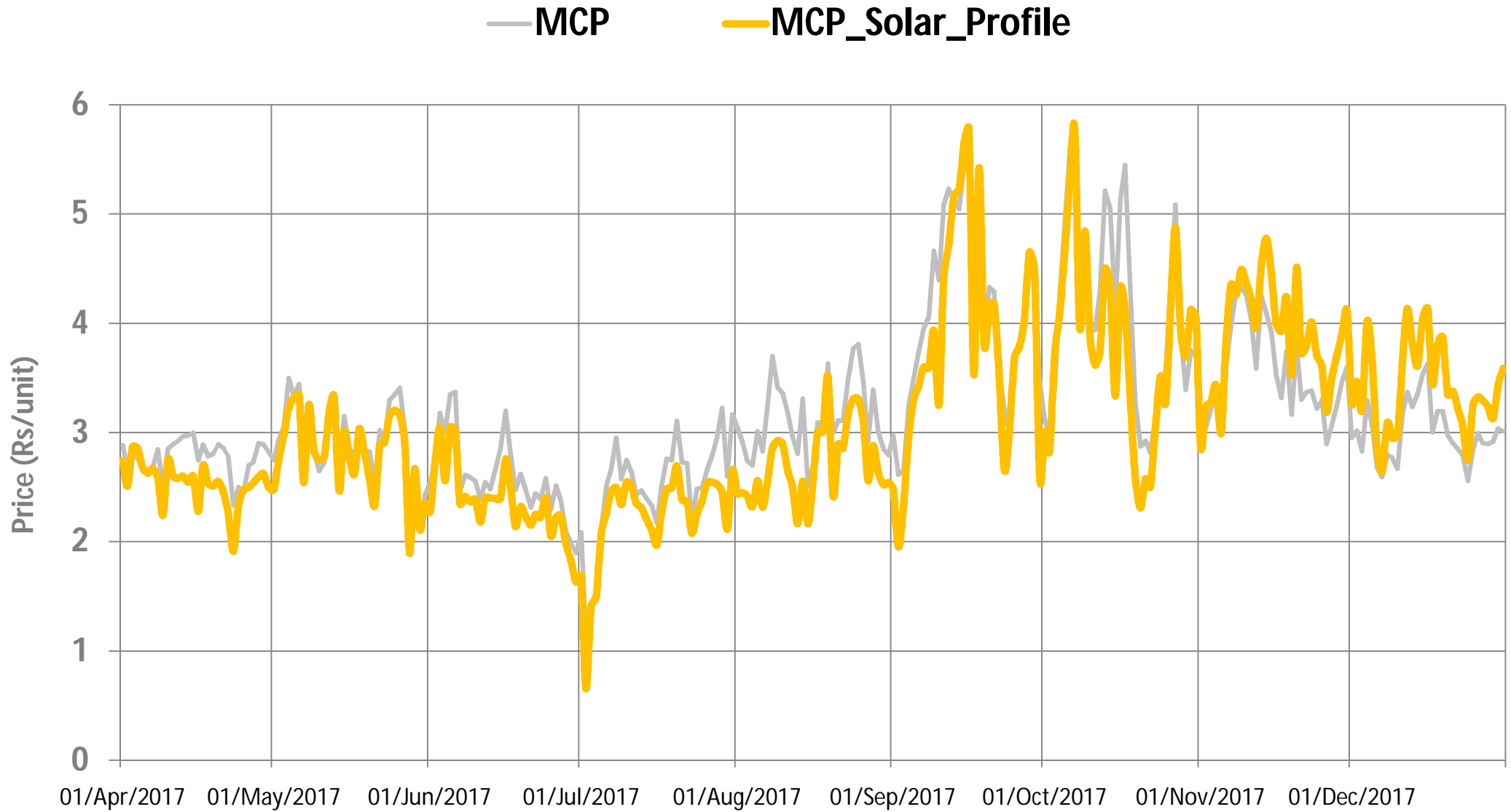
- It follows the demand pattern
- Much accurate forecast on Day ahead basis
- Minimal deviation

Monthly Prices at IEX (FY 17-18)



Data till 31st Dec 2017

Daily Prices at IEX (FY 17-18)





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RENEWABLE ENERGY

CERTIFICATES

DAY AHEAD MARKET

GREEN DAY AHEAD MARKET

(PROPOSAL)



MARKET INTERVENTIONS / RE INTEGRATION

Market Interventions

- **Liquid intra-day markets**
 - Already 100% higher volume this year in intra-day markets
 - Few States like WB, DVC, Bihar, MP, TL participating
 - Participants to actively bid
 - **Gate Closure to be reduced to 1 hr (present 3 hours)**
 - All markets have gate closure ≤ 1 hour
 - **Transmission charges waived off** (USA – no transmission fee for intra-day transaction)
- **Aggregation / Balance Responsible Party**
 - Virtual Power plant - aggregated wind/solar/gas based plants under one agency to bid and participate as single logical generator
- **Grid Expansion (Market Coupling)**
 - South Asian Grid – Nepal and Bhutan can provide useful balancing resources
- **Ancillary Service/ Balancing Market**
 - Will also test viability of Storage devices
- **Capacity Market**
 - Based on adequacy requirement, Discom to buy capacity
 - Capacity tied up - but no energy commitments
 - Generators free to sell energy in the market
 - Need debate in Indian perspective



ABOUT IEX

Company Snapshot



- Market Share: **98%**
- Average daily trade: **5500 MW**
- Growth @CAGR >30% in last 5 years
- High Participation: **4300+**
3800+ Industries | **47** Discoms (all) | **380+** Generators






Transparency

Liquidity

Competition

Market Share-FY 17 (All Products)
 Average Daily Trade- FY17
 Participation-as on 31 Mar 2017

Key statistics: Electricity & REC Market

	ELECTRICITY	REC
 Market Share (FY16-17)	95%	63%
 State Utilities	29 States 5 UTs	17 States 5 UTs
 Generators	417	843
 Industrial Consumers	3945	2,458
 Average Daily Volume	>110,000 MWh <i>Highest : 183 000 MWh</i>	>1 Crore RECs Highest: 12,87,814 RECs

IEX Data as on 31 DEC, 2017

Thank You

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