

Centre for Energy Finance

CEEW-CEF Market Handbook 2021-22 (Annual issue)

05 May 2022

© Council on Energy, Environment and Water 2022



CEEW-CEF Market Handbook

India is undergoing an energy transition from fossil-based to clean energy. Evidence-based decision-making can accelerate the process.

CEEW Centre For Energy Finance's Market

Handbook aims to help key investors, executives and policymakers with evidence-based decision-making by:

- Identifying and analysing trends critical to India's energy transition
- Presenting data-backed evidence based on the most relevant indicators
- Connecting the dots and presenting a short-term market outlook

The handbook attempts to comment and answer on some critical questions such as:

- 1. What is India's generation capacity and energy mix?
- 2. What are the key trends in renewable energy (RE) tariffs?
- 3. What is the current situation of the discom payment delay situation?
- 4. How have the power market reforms progressed?
- 5. What are key trends in the electric vehicles (EV) and energy storage markets?

Contents

	(
	(
	ŀ
	ŀ
	•
₹	ŀ
	l
	l
	ļ

Generation Capacity And Energy Mix	
Coal Phase-Out	
RE Auctions	
Discom Payables	
Power Markets	
Policy and Regulatory Developments	1
Renewable Energy Finance	1
Energy Storage	1
Electric Mobility	1
Annexures	1
About Us	2

6

8

n

20



Generation capacity: solar capacity crossed the 50 GW mark in FY22; the share of RE in total power capacity added in FY22 was 89.1%

Installed capacity mix (GW)



Source: Central Electricity Authority (CEA). *Includes solar (rooftop) capacity (6,645.7 MW as of March 2022).



Takeaways & Outlook

In FY22, a net power capacity of 17.3 GW was added (versus 12.1 GW in FY21) It was primarily dominated by renewable energy (RE) (15.5 GW or 89.1%), followed by coal/lignite (1.4 GW or 8.1%) and hydro (0.5 GW or 3.0%).

In RE, solar (grid-scale and rooftop) continued to dominate. It accounted for 13.9 GW (90.0%), more than twice the capacity added in FY21 (5.5 GW). Wind capacity addition remained tepid at 1.1 GW in FY22 (versus 1.6 GW in FY21).

After a slower first quarter, RE capacity addition gained momentum in Q2 FY22 (4.6 GW), Q3 FY22 (3.3 GW) and Q4 FY22 (5.0 GW), consistently surpassing FY20 and FY21 levels. **Solar rooftop capacity addition stood at 2.3 GW in FY22 (versus 1.9 GW in FY21).**

In FY22, around 17.47 GW of RE capacity was auctioned. Grid-scale solar PV (11.7 GW) emerged as the dominant technology, followed by solar-wind hybrid technologies (4.2 GW, including round-the-clock power).

FY22 witnessed the conclusion of two solar PV with storage capacity (120 MW), and floating solar (15 MW) bids.

Source: Ministry of New and Renewable Energy.

Energy mix: despite an increase in the share of RE in the generation mix in FY22, the share of RE + hydro remained almost constant; the share of coal/lignite up



RE share snapshot

	FY20			FY21	FY22		
	RE share %	Day	RE share %	Day	RE share %	Day	
Highest	15.9%	09 July 2019	16.8%	12 August 2020	19.2%	08 August 2021	
Lowest	5.3%	24 September 2019	6.1%	02 September 2020	7.0%	23 December 2021	
Average (daily)	9.4%	NA	10.1%	NA	10.8%	NA	

Takeaways & Outlook

Total electricity generation was up by 8.0% in FY22 compared to FY21. Contributing factors included lower-than-normal monsoons in Q2, the early onset of summer in Q4 (hottest March* in recorded history of 122 years) and continuous improvement in economic activity.

- **Q1:** Up by 17.2%
- **Q2:** Up by 9.1%
- **Q3:** Up by 2.7%
- **Q4:** Up by 4.0%
- Total FY22: Up by 8.0%

Overall RE generation in FY22 increased by 15.7%, large hydro generation marginally grew by 1.5%, whereas coal/lignite generation grew significantly by 10.1% (versus FY21).

From an average daily generation perspective, the share of RE and coal/lignite increased, whereas hydro share declined in FY22 compared to FY21.

- **RE:** Share up from 10.1% to 10.8%
- **Hydro:** Share down from 12.3% to 11.5%
- **RE + Hydro:** Almost constant from 22.4% to 22.3%
- **Coal/lignite:** Share up from 71.1% to 72.5%

• • •

Source: POSOCO. Note: RE technologies include solar, wind, biomass, waste-to-energy and small hydro and do not include rooftop solar and large hydro (>25 MW) generation. *IMD March 2022.



Capacity added Capacity retired

Source: CEA.



% share of conventional generation in total gross assets

Takeaways & Outlook

In FY22, net coal capacity addition [capacity added (4.5 GW) less the capacity retired (1.6 GW)] declined by 33.4% compared to FY21. In Q1 FY22, zero coal capacity was added for the first time in 14 quarters, whereas 670 MW was retired.

PFC/REC, one of India's largest power sector financiers, continues to reduce its exposure to coal power generation. The share of conventional generation in PFC/REC's loan book is trending downward and declined to 48% in Q3 FY22 from 51% in Q4 FY21 and 54% in O3 FY21.

To compensate, PFC/REC has diverted their focus to transmission and distribution (T&D) and RE generation projects (including large hydro). This accounts for around 41% (INR 1,51,023 crore) and 10% (INR 38,215 crore) of its total loan book **as of Q3 FY22** versus 35% (INR 1.28.766 crore) and 11% (INR 38.681 crore) as of Q3 FY21, respectively.

PFC/REC's overall gross loan assets haven't observed any noticeable change during this period.

Source: PFC investor presentations; figures are derived from the same. Note: Sector-wise break up of PFC loan asset data unavailable for Q4 FY22.

RE auctions: SECI's RE + thermal/hydro round-the-clock (RTC) power, solar + ESS and windsolar hybrid bids were notable additions to the RE auction formats



Bid spotlight: SECI, Karnataka, solar, tranche-X, 1,200 MW

Tariff and winner

- Tariff discovered: 2.35 INR/kWh
- Winners: Ayana Renewable and Fortum

Key provisions

- Identification of injection point: ISTS substations in Gadag and Koppal districts in Karnataka.
- **Project location:** Project (contracted capacity) to be set up at single or multiple locations.
- Project commissioning: Part and early commissioning are allowed, SECI to purchase

the energy from such early commissioned project at 75% of the PPA tariff (if discom agrees to buy).

Comments

• Earlier, SECI and KSPDCL were to facilitate the successful bidders to acquire land on a sublease basis from KSPDCL. This clause on land acquisition was amended.

• This substation-based auction was oversubscribed by 4,930 MW.

Takeaways & Outlook

Auctioned RE capacity stood at 17.47 GW in FY22, including SECI's 2.5 GW RE + thermal/hydro RTC-II and 1.2 GW windsolar hybrid and IREDA's# 5 GW solar tranche-III. Additionally, auctions for a 20 MW solar PV with 20 MW/50 MWh BESS in Leh and 100 MW solar with 120 MWh BESS in Chhattisgarh were concluded.

Although the COVID-19 second wave slowed down the auction capacity in Q1 FY22, **Q2** and Q3 FY22 witnessed notable growth.

- **Q1:** 0.425 GW
- **Q2:** 10.12 GW
- Q3: 5.085 GW
- **Q4:** 1.84 GW

Solar module (global) prices** continued to increase during most of FY22 due to an increase in the cost of raw materials. Module prices surged from 16 INR/Wp in Q1 to 22 INR/Wp in Q4 (versus remaining steady at ~15 INR/Wp levels throughout FY21). Rising module prices and an imminent imposition of BCD (basic customs duty) on modules from April 2022, led to higher solar tariffs in FY22 compared to the lowest tariff discovered in FY21 at 1.99 INR/kWh.

Source: SECI and state renewable agencies.

SECI = Solar Energy Corporation of India; GUVNL = Gujarat Urja Vikas Nigam Limited; MSEDCL = Maharashtra State Electricity Distribution Company Limited; RUMSL = Rewa Ultra Mega Solar Limited; PSPCL = Punjab State Power Corporation Limited; RTC = round-the-clock; MAHAGENCO = Maharashtra State Power Generation Company; BESS = battery energy storage system. *Note: For Q1, Q2 and Q3 FY22, only the least tariff auctions as well as unique auctions such as RTC, have been covered. **Cybex import data. # IREDA = Indian Renewable Energy Development Agency.



Discom payables: amount overdue by discoms increased by 32% in FY22

Discom payable and receivable days for RE-rich states power producers (INR crore) 350 days March 2022 1,27,784 300 February 2022 1,27,627 6 个 3% TS* • January 2022 1.26.079 sXep ; 1,23,657 December 2021 purchase payable November 2021 1.19.936 200 October 2021 1,17,480 • КА September 2021 1,15,384 150 Ο ΑΡ UP Power CG 1,21,599 August 2021 RJ MH 100 July 2021 1.22.019 TN. 90 days June 2021 89,154 个 32% HR* 50 AS MP May 2021 96.226 UK GI* April 2021 90,283 Ω Ω 50 100 150 200 250 300 350 97.020 March 2021 Power sale receivable days

Source: PRAAPTI portal (Based on voluntary disclosures from power producers).

Amount overdue by discoms to

Q4 FY22

Q3 FY22

Q2 FY22

FY22

5

Source: UDAY portal (based on data disclosed by discoms as of 31 December 2021). *Data not available for these states; values derived from 2019–20/ 2020–21 financial reports.

Reforms-based and results-linked, revamped distribution sector (RDSS) scheme, approved in June 2021, aims to reduce AT&C losses to pan-India levels of 12-15% by 2024-25, reduce ACS-ARR gap to zero by 2024-25, and develop institutional capabilities for modern discoms.

Takeaways & Outlook

The overdue amount payable by discoms to power producers increased by 3% in Q4 FY22 (INR 1,27,784 crore) compared to Q3 FY22 (INR 1,23,657 crore) and increased by 32% compared to O4 FY21 (INR 97.020 crore).

According to the Ministry of Power's (MoP) Ujwal DISCOM Assurance Yojana (UDAY) platform, discoms in Karnataka, Gujarat, Kerala, Rajasthan and Haryana topped the latest quarterly performance assessment*.

From a payment delay standpoint, discoms in Gujarat, Assam, Madhya Pradesh and Uttarakhand, cleared their power purchase dues within 45 days (as of December 2021). On the other hand, discoms in Telangana, Karnataka, Andhra Pradesh, Uttar Pradesh and Chhattisgarh took more than 120 days to clear their dues.

MoP notified the progress of the RDSS (reforms-based and result-linked) scheme for discoms issued in June 2021 with an outlay of INR 3,03,758 crore over five years. Meghalaya and Assam emerged as frontrunners in terms of announcing their reform plans under the scheme.

400



Power markets: Q4 FY22 witnessed a steep rise in electricity demand similar to Q2 FY22; dayahead market prices hit a 13-year high on IEX in March 2022



Power supply position (peak and electricity demand)

Source: CEA.

Quarterly peak power demand in FY22 consistently surpassed FY21 and FY20 levels; it touched the 200 GW mark in Q2 and Q4. With improved economic activity, lower-than-normal monsoons and the early onset of summer, average electricity demand saw an uptick of 7% in FY22 (vs FY21).

Day-ahead spot market snapshot (IEX)



Day-ahead market (DAM) achieved 65,151 million kWh volume in FY22 registering a 7.8% growth (vs FY21). The year saw a considerable hike in prices with electricity demand rising notably and high-priced imported coal and gas for the merchant power capacity supplying through DAM.



Green term-ahead market (GTAM) achieved 3,933 million kWh traded volume in FY22, seeing a 403% growth in FY22 (vs FY21). Q4 FY22 saw a notable increase in prices owing to low supply-side volumes due to the low solar-wind season.

Real-time market snapshot (IEX)



In FY22, the real-time market (RTM) traded 19,910 million kWh, registering a 110% growth in FY22 (vs FY21). Since its inception, discoms have been tapping into the RTM for power demand-supply balancing in real-time.

Takeaways & Outlook

Peak power demand continued to soar in FY22. It reached a **new high of 203 GW in July 2021** and again crossed the **200 GW mark in March 2022**. In energy terms, the average monthly electricity demand (met) saw an uptick of 7% in FY22 (versus FY21).

The average prices on IEX's day-ahead market surged in Q4 FY22 to the highest level since April 2009, owing to a steep rise in electricity demand and high-priced imported coal and gas for the merchant power capacity supplying the market.

On 24 November 2021, IEX and PXIL resumed renewable energy certificates (REC) trading. In total, 2,04,181 solar and 5,45,658 non-solar RECs were traded at an average price of 2.283 INR/kWh and 1.0 INR/kWh in Q4 FY22 on IEX, respectively.

Further, in Q3 FY22, the **Central Electricity Regulatory Commission (CERC) approved the green day-ahead contract (GDAC)** or **green day-ahead market (GDAM)** on the IEX and PXIL power exchanges. Since its inception, 921 million kWh of energy was traded on GDAM with 751 participants. **In Q4 FY22, hydropower contracts were also introduced in GTAM.**

Policy and regulatory developments: CERC approved the introduction of hydropower contracts in GTAM; MoP notified *Green Hydrogen Policy*; MNRE revised the ALMM list five times in FY22

MNRE amended the ALMM* of solar PV modules order, 2019

- According to the <u>amended order</u>, only the models and manufacturers included in the ALMM list are eligible for use in open-access and netmetering projects.
- The amendment shall be <u>applicable</u> from 1 October 2022.
- Previously, only government, government-assisted projects, and projects under government schemes & programmes were included.

CERC approved introduction of hydropower contracts in GTAM

- In February 2022, <u>CERC approved</u> <u>IEX's</u> petition seeking approval to introduce the hydropower contracts in GTAM.
- It aims to facilitate hydropower purchase obligation compliance.
- It will include intra-day hydro contracts, day-ahead contingency hydro contracts, daily hydro contracts and weekly hydro contracts in GTAM.

MoP notified the Green Hydrogen Policy

- Aligned with the announcement of the National Hydrogen Mission in August 2021, on 17 February 2022, the MoP released the <u>Green</u> <u>Hydrogen Policy.</u>
- The policy will provide various benefits to green hydrogen/ ammonia manufacturers such as a waiver of ISTS charges for 25 years, grant of open access within 15 days, banking of RE for 30 days, land allotment in RE parks.
- Additionally, the RE utilised to generate green hydrogen/ ammonia will be counted under renewable purchase obligation (RPO) compliance.

MNRE issued the framework for the promotion of DRE livelihood applications

 In February 2022, the <u>MNRE</u> issued the framework to scale up currently available DRE livelihood applications and support the development of new DRE livelihood applications.

CERC announced Deviation Settlement Mechanism and Related Matters Regulations, 2022

- In March 2022, <u>CERC</u> announced the Deviation Settlement Mechanism and Related Matters Regulations, 2022.
- Through a commercial mechanism, it aims to ensure that consumers do not deviate from and adhere to their schedule of drawal and injection of electricity from the grid.
- The regulation includes applicable charges for deviation for both over/under injection and over/ under withdrawal.

MNRE updated List – I under ALMM* order for solar PV modules

- In March 2022, the <u>MNRE</u> updated list-1 under the ALMM. it increased the number of manufacturers to 46 with a capacity of 11,415 MW.
- New entrants include ECE Energies Pvt. Ltd., Rayzon Green Energies, Lubi Electronics, Kosol Energie Pvt. Ltd., and Citizen Solar Pvt. Ltd.

Takeaways & Outlook

FY22 saw a positive policy signal for the rooftop solar PV market, with the MoP increasing the cap on the **net-metering provision from 10 kW to 500 kW**. The MoP also extended the **waiver of ISTS charges for solar/wind projects till June 2025** and included **open access** under the ambit of the waiver. In Q2 FY22, MoP issued the **amendments to the existing REC mechanism.** In Q3, the IREDA <u>announced</u> **the winners and waitlist of the Production-Linked Incentive (PLI) scheme** for manufacturing solar PV modules. In Q4, **the fund allocation for the PLI scheme was increased to INR 19,500 crore.**

Further, since its launch in March 2021, **the ALMM (solar) has been updated five times to now include 46 domestic module manufacturers.** In December 2022, the MNRE released the <u>RLMM</u> of wind turbines (revised time-to-time) that includes 15 manufacturers.

In addition, the implementation period for the FAME II scheme was extended for two years in June 2021. **During FY22, four states** (Odisha, Goa, West Bengal and Gujarat) notified their electric vehicle policies.

Renewable energy finance: market concentration in RE auctions declined slightly in FY22 compared to FY21

Notable deals (FY22)

1	Acquisition				
March 2022	Target: Surya Vidyut Acquirer: Torrent Power Amount: INR 811.5 crore (USD 107 million)				
- hurren (Acquisition				
2022	Target: Sterling & Wilson Acquirer: Reliance Industries Amount: INR 2,859.13 crore (USD 377 million)				
	Acquisition				
January 2022	Target: ReNew Power Acquirer: Fourth Energy Partner Amount: INR 650 crore (USD 87 million)				
	Acquisition				
October 2021	Acquisition Target: REC Solar Holdings Acquirer: Reliance New Energy Solar Amount: INR 5717.9 crore (USD 771 million)				
October 2021	Acquisition Target: REC Solar Holdings Acquirer: Reliance New Energy Solar Amount: INR 5717.9 crore (USD 771 million) Asset acquisition				
October 2021 August 2021	Acquisition Target: REC Solar Holdings Acquirer: Reliance New Energy Solar Amount: INR 5717.9 crore (USD 771 million) Asset acquisition Target: L&T (Hydro asset), NA (Solar asset) Acquirer: ReNew Power Amount: INR 2824.5 crore (USD 384 million)				
October 2021 August 2021	Acquisition Target: REC Solar Holdings Acquirer: Reliance New Energy Solar Amount: INR 5717.9 crore (USD 771 million) Asset acquisition Target: L&T (Hydro asset), NA (Solar asset) Acquirer: ReNew Power Amount: INR 2824.5 crore (USD 384 million) Acquisition				

91% Q4 FY22 **51%** FY22

Market concentration in auctioned RE capacity

Note: Market concentration is calculated as the ratio of the top five RE capacities auctioned to the total RE capacity auctioned

Developer-wise* RE capacity auctioned during FY22 (17,470 MW)

Operational RE capacity in India (MW)

NTPC		3265	1,660
ReNew Power	1800		2,688
SJVN	1715		106
Ayana Renewable	1050		2,190
Greenko	1001		5,367
Tata Power	1000		2,637
NHPC	1000		110
Fortum	800		435
Adani	720		5.410
Acme Solar	675		1,500

Takeaways & Outlook

In FY22, around 17.47 GW of RE capacity was auctioned. Public sector undertakings (PSU) such as NTPC and SJVN were among the top developers to capture the RE auctions market in FY22, followed by private sector developers such as ReNew Power, Ayana Renewable, Greenko and Tata Power.

New market entrants such as Hindustan Thermal Projects (250 MW) and Power Mech Projects (550 MW) won capacities in the SECI's RE + thermal/hydro RTC-II bid.

The market concentration saw a slight decline in FY22 to 51% (versus 52% in FY21), with a diverse set of public and private sector developers participating in the auctions (a total of 27 in FY22).

In FY22, the deal activity **primarily consisted** of solar and hydro project acquisitions, as well as those in the solar module/cell manufacturing sector. In a historic deal, Adani Green Energy acquired SB Energy's portfolio (the largest in the RE sector in India till now). In Q4, Reliance Industries acquired a 40% stake in Sterling & Wilson Solar, a solar EPC company. Further, ReNew Power sold its rooftop business to Fourth Partner Energy.

Source: CEEW-CEF Compilation.

Source: CEEW-CEF Compilation. *Note: Includes only top 10 developers in terms of auctioned capacity.

Renewable energy finance: most RE stocks notably outperformed the market in FY22; NYSE listed Azure Power's share price dropped with a widening quarterly net loss in FY22



Takeaways & Outlook

In FY22, all the listed RE stocks (except the NYSE listed solar project developer Azure Power) notably outperformed the market (Sensex), which was in turn up by 18% as of March 2022 (versus March 2021).

The share price of the pure-play RE developer, Adani Green Energy, significantly outperformed the market consistently throughout FY22, **up by 75% as of March 2022** (versus March 2021). The share price of **Borosil** Renewables, which holds a monopoly position in India's solar panel glass manufacturing, was **up by 137% as of March 2022 (versus March 2021).**

The stock prices of wind developer– manufacturers **Inox Wind and Suzlon Energy** were **up by 60% and 83%** in this period, respectively. **A consistent expansion of their order books and increasing quarterly profits attracted investor interest.**

The widening quarterly net loss being reported by Azure Power during FY22 led to subdued investor interest in the stock.

Renewable energy finance: ~USD 4.94 billion raised through green bonds in FY22 to refinance existing costlier debt



Source: Reserve Bank of India, State Bank of India, Trading Economics, Money Control and BondEvalue. * Current yield. **SLBs are issued with specific sustainability performance targets that include predefined key performance indicators (KPIs) and allow a diverse set of issuers to obtain financing via this route.

Takeaways & Outlook

In FY22, India saw a notable rise in green and sustainability-linked bond (SLB)** issuances in the international markets. This includes the USD 4.94 billion (versus USD 3.3 billion in FY21) green bonds issued by RE developers such as Greenko, ReNew Power, Acme Solar, and Adani Green Energy (see Annexure I). In addition, JSW Steel, Adani Electricity Mumbai Ltd., and JSW Infrastructure raised USD 1.7 billion through SLBs.

In Q4 FY22, ReNew Power raised USD 400 million at a 4.50% interest rate for five years, and Greenko raised USD 750 million at 5.50% for three years through green bonds. In FY22, the international bonds market saw the lowest-ever coupon rate achieved by an Indian RE developer at 3.575%, raised by Azure Power.

In addition, <u>Avaada Energy</u> plans to issue domestic green bonds worth INR 1,440 crore (USD 192 million) after Vector Green Energy raised finance through the first-ever green bond in the domestic market.

Key bond yields in India, including the 10-year treasury and NTPC's 10-year bond yields, saw a spike in Q4 FY22 following expectations of a likely rate hike by the US Federal Reserve.

Energy storage: four companies (50 GWh) selected under the PLI scheme for battery storage manufacturing

Second-life battery ESS projects

Group) and

Nissan,

(March

RWE and

Germanv

(December

Audi,

2021)

Spain

2022)

- Enel's subsidiary Endesa commissioned a 4 MW / 1.7 MWh second-life battery ESS project.
- It combines 78 Nissan electric vehicle (EV) Endesa (Enel batteries, of which 48 are disused and 30 are new at a conventional power plant in Melilla, Spain.
 - In the event of plant failure, second-life battery ESS can supply the grid for 15 minutes.
 - This will help avoid load shedding events and improve grid reliability.
 - RWE and Audi have commissioned an ESS consisting of used Li-ion batteries from the Audi e-tron EV.
 - It is a 4.5 MWh pilot project located at RWE's pumped-storage power plant at the Hengsteysee reservoir, consisting of 60 batteries.
 - Initially, this pilot project will help maintain ٠ the frequency in the electricity grid and later it will be tested for providing grid flexibility.

ndia's recent	energy	storage	tenders
---------------	--------	---------	---------

Project location & tender issue date	Application & technology	Details
Pan India (NTPC), January 2022	500 MW wind/solar with 3000 MWh BESS	Bid conclusion expected in Q1 FY23 (extended)
Pan India (REMCL*), November 2021	150 MW RE, thermal, hydro and gas with ESS in RTC manner	Bid conclusion expected in Q1 FY23
Rajasthan (SECI), October 2021	500 MW/1000 MWh standalone BESS (ESS-I)	Draft RfS released in Q3 FY22
Gujarat (GSECL) (EPC), September 2021	35 MW solar with 57 MWh BESS	Bid conclusion expected in Q1 FY23
Greater Noida, Uttar Pradesh (NTPC), June 2021	4 MW solar with 1 MW/1 MWh BESS	Bid conclusion expected in Q1 FY23
Maharashtra (REMCL*), June 2021	15 MW solar with 7 MW/14 MWh BESS, (railway land)	Under evaluation, bid conclusion expected in Q1 FY23
Tamil Nadu (TANGEDCO), February 2021	1 MW solar with 3 MWh BESS	Bid conclusion expected in Q1 FY23
Leh & Kargil (SECI), January 2020	14 MW solar with 42 MWh BESS	Results expected in Q1 FY23 (extended)

Takeaways & Outlook

Multiple energy storage tenders were announced in FY22. This includes REMCL's* pan India 150 MW RE with thermal, hydro, gas, or energy storage tender, SECI's 500 MW/1000 MWh standalone BESS (draft RfS released), and NTPC's 500 MW wind/solar with 3000 MWh BESS. In FY22, the SECI concluded two notable tenders, namely, a 100 MW solar with 120 MWh BESS in Chhattisgarh and a 20 MW solar with 50 MWh BESS in Leh. Ladakh. In addition. SECI concluded the pan India 2,500 MW RE + thermal/hydro/storage RTC-II auction.

In March 2022, four companies (50 GWh) were selected for incentives under the Production Linked Incentive (PLI) scheme for Advanced Chemistry Cell (ACC) battery storage manufacturing. The PLI scheme for ACC battery storage received an encouraging response from 10 bidders (130 GWh capacity).

In FY22, notable joint ventures (JV)/ investment activities took place in the domestic energy storage market. ReNew Power and Fluence formed a JV, Ayana Renewables partnered with Greenko for pumped hydro storage and Reliance Industries invested in Faradion and Ambri.

Source: Press release by Enel (March 2022) and RWE (December 2021). ESS = energy storage system.

Source: SECI and state renewable agencies. RfS = request for selection. *REMCL = Railway Energy Management Company Limited.

Electric mobility: electric vehicle sales increased by 233% in FY22 versus FY21; 2W segment dominated EV sales in FY22



Takeaways & Outlook

FY22 emerged as a historic fiscal year for electric vehicle (EV) and hybrid vehicle sales. **EV sales grew by 233% in FY22 (versus FY21).** EV sales as a share of overall vehicle sales went up from 0.97% in Q1 FY22 to 4.02% in Q4 FY22.

For 3Ws, the share of electric 3Ws (including e-rickshaws) was 46% in FY22. For buses, the share of e-buses was 9% in FY22.

In the Union Budget 2022-23, the FAME-II scheme received a significant boost in terms of fund allocation, which was increased from INR 800 crores to INR 2,908 crores. Additionally, the government announced a battery swapping policy along with interoperability standards to improve efficiency in the EV ecosystem.

OEMs with the highest EV sales* in FY22 were:

- **2W:** Hero Electric (69,215), Okinawa (51,786) and Ampere (27,523)
- **3W:** Y.C. Electric (17,050), Saera Electric (8,474) and Mahindra Electric (8,000)
- **4W:** Tata Motors (11,062), Mahindra Electric (4,976) and MG Motors (2,041)

Source: Vahan Sewa dashboard (includes only registered vehicles, unregistered vehicles include low-speed vehicles (< 25 km/hr), e-rickshaws (three-wheelers) and electric two-wheelers), Electric Mobility Dashboard (2021), CEEW Centre for Energy Finance. *Based on sales data up to Q4 FY22.

Thank you

You can find us at cef.ceew.in | @CEEW_CEF

Authors

Ruchita Shah (ruchita.shah@ceew.in) Nikhil Sharma (nikhil.sharma@ceew.in) Meghna Nair (meghna.nair@ceew.in) Shreyas Garg (shreyas.garg@ceew.in)

Reviewer Gagan Sidhu (gagan.sidhu@ceew.in)

Annexure I: Green bond issuances

Date	Company	Size (USD million)	Sector	Coupon rate (%)	Rating	Tenor (Years)	Purpose
March 2022	Greenko	750	Energy storage	5.50%	Ba1 (Moody's)	3	Refinance existing debt and fund the capital expenditures at asset level
January 2022	ReNew Power	400	Solar and wind	4.50%	BB- (Fitch)	5.25	Refinance existing debt and fund capital expenditure
September 2021	Adani Green Energy	750	Solar and wind	4.375%	Ba3 (Moody's)	3	Fund equity portion of capital expenditure for under-construction projects
August 2021	Azure Power	414	Solar	3.575%	Not available	5	Refinance existing higher cost green bond debt
July 2021	Acme Solar	334	Solar	4.70%	Not available	5	Refinancing of existing debt
July 2021	Vector Green Energy	165	Solar	6.49%	AAA (CRISIL, India Ratings)	3	Refinance existing high-cost debt of solar projects
May 2021	JSW Hydro	707	Hydro	4.50%	BB+ (EXP) (Fitch)	10	Repayment of existing green project- related rupee-denominated debt
April 2021	ReNew Power	585	Solar and wind	4.50%	BB- (Fitch)	7.25	Refinancing of existing debt
March 2021	Greenko	940	Solar and wind	3.85%	BB (Fitch)	5	Redemption of previous fund raise
March 2021	Hero Future Energies	363	Solar and wind	4.25%	BB- (Fitch)	6	Refinancing of existing debt
February 2021	ReNew Power	460	Solar and wind	4.00%	BB- (Fitch)	6	Refinancing of existing debt
February 2021	Continuum Green Energy	561	Solar and wind	4.50%	BB+ (Fitch)	6	Refinancing of existing debt

Source: Climate Bonds Initiative and company press releases.

Annexure I: Green bond issuances

Date	Company	Size (USD million)	Sector	Coupon rate (%)	Rating	Tenor (Years)	Purpose
October 2020	CLP Wind Farms	40	Wind	Not available	AA (India Ratings)	2 to 3	Refinancing of existing debt
October 2020	ReNew Power	325	Solar and wind	5.375%	BB- (Fitch)	3.5	Refinancing high-cost local debt
January 2020	ReNew Power	450	Solar and wind	5.875%	BB-/Stable (Fitch)	5	Refinancing of maturing debt
October 2019	Adani Green Energy	362.5	Solar and wind	4.625%	BBB- (Fitch)	20	Repaying foreign currency loans and rupee borrowings
September 2019	ReNew Power	90	Solar and wind	6.67%	BB (Fitch)	4.5	Refinancing of existing debt
September 2019	Greenko	85	Solar and wind	5.95%	BB- (Fitch)	6.75	Refinancing of existing debt
September 2019	Azure power	350	Solar	5.65%	BB (Fitch)	5	Refinancing of existing debt
September 2019	ReNew Power	300	Solar and wind	6.45%	Ba2 (Moody's)	5	Capacity expansion and repaying high cost debt
August 2019	Greenko	85	Solar and wind	6.25%	Ba1 (Moody's)	3.5	Refinancing of solar and wind projects
August 2019	Greenko	350	Solar and wind	6.25%	Ba1 (Moody's)	3.5	Refinancing of solar and wind projects
July 2019	Greenko	450	Solar and wind	5.95%	BB (Fitch)	7	Refinancing of solar and wind projects
July 2019	Greenko	500	Solar and wind	5.55%	BB (Fitch)	5.5	Refinancing of solar and wind projects

Source: Climate Bonds Initiative and company press releases.

Annexure II: Key electric mobility facts and figures



Note: Target of selling 1,562,000 EVs (2W, 3W, 4W and buses) under FAME-II scheme by FY22

Recent electric vehicle launches



MG ZE EV Facelift

Price: INR 21,99,800 onwards Range: 461 km Battery capacity: 50.3 kWh



Okinawa OKHI-90

Price: INR 1,21,866 onwards Range: 160 km Battery capacity: 3.6 kWh



iVOOMi S1

Price: INR 84,000 onwards Range: 115 km Battery capacity: 2 kWh



AMO Jaunty Plus

Price: INR 1,10,000 onwards Range: 120 km Battery capacity: 60V/40Ah



EV sales per 1000 non-EV sales

As of FY22









165 Total FAME II approved models As of FY22

10,66,609 EVs sold As of FY22











cef.ceew.in

Share of EV Bus and 3W in total bus and 3W sales in FY22

For more updates visit <u>CEEW-CEF Electric Mobility Dashboard</u>

Source: Vahan Sewa dashboard, CEEW Centre for Energy Finance Electric Mobility dashboard, Department of Heavy Industries, CEA.

About us: CEEW is among Asia's leading policy research institutions



e e e cef.ceew.in

CEEW Centre for Energy Finance

Build evidence

Consistent, reliable, and up to date monitoring & analysis of clean energy markets – investment, payment schedules, market trends, etc.

Create coherence

Periodic convening of multi-stakeholder groups to deliberate on market activities in clean energy

Design solutions

Design and feasibility pilots of fit-forpurpose business models & financial solutions for clean energy solutions

Our recent publications, dashboards and tools



How have India's RE Policies Impacted its Wind and Solar Projects?

Valbhav Pratap Singh, Meghna Nair, and Sangeeth Raja



Executive summary

seep GE2, sector is a high copie file to isocataroo sector of electricity of the course rest of exactaroo sector of electricity of the course rest of exactaroo sector of electricity of the course rest of exactaroo sector of electricity of the course rest of energy of the sector of the sector of the course of electricity of the course of the sector of the sector of the sector of the course of the sector of

How have India's RE Policies Impacted its Solar and Wind Projects



India Renewables Dashboard

CEEW Course for

Investment Sizing India's 2070 Net-Zero Target Valbav Pratap Sight and Grgan Sidhu



Executive summary On the sector sector before the sector of the sector o

are decised weight weight weight and the distribution to the second of the second of the second of the second second of the second of the second of the second the second of th

Investment Sizing India's 2070 Net-Zero Target



Open Access Tool

CEEW COP26

Advancing Article 6 Negotiations A Proposal to Resolve the Certified Emissions Reductions (CERs) Transition Deadlock Anjun Dut





Executive summary

The set "Control of the theory CBD of the theory CBD of the theory CBD of the theory CBD o

Advancing Article 6 Negotiations



Financing India's Energy Transition Through International Bond Markets



Electric Mobility Dashboard

