November 2025

Initiating Coverage | Sector: Utilities

Waaree Energies

Bellwether solar manufacturing play

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Bellwether solar manufacturing play

- We initiate coverage on the solar cell and module manufacturing sector, with a Buy rating on Waaree Energies Limited (WEL) and a TP of INR4,000.
- WEL, a bellwether in India's solar manufacturing space with 5.4GW cell and 16.1GW module capacity, along with a 2.6 GW plant in the US. WEL towers domestic competitors and enjoys a formidable capacity market share of 21.6%/13.3%.
- It plans to expand total capacity to 15.4GW/26.7GW/10GW (cell/module/ingot-wafer) by FY26/FY27. As WEL expands capacity, we estimate a CAGR of 43% in EBITDA and 40% in PAT over FY25-28.
- Its integrated presence across EPC, BESS, inverters, and green hydrogen supports diversified growth, with new businesses estimated to contribute 15% of EBITDA by FY28E.

Waaree Energies

BSE Sensex	S&P CNX
83,459	25,598

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Stock Info

Bloomberg	WAAREEEN IN
Equity Shares (m)	288
M.Cap.(INRb)/(USDb)	969.2 / 10.9
52-Week Range (INR)	3865 / 1809
1, 6, 12 Rel. Per (%)	-5/26/6
12M Avg Val (INR M)	7850
Free float (%)	35.8

Financial Snapshot (INR b)

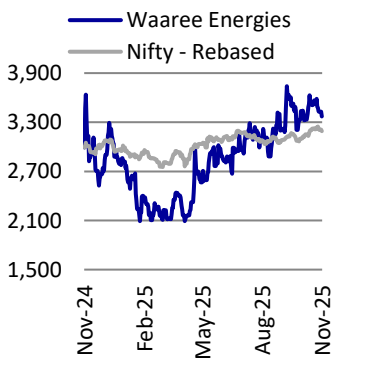
Y/E March	FY26E	FY27E	FY28E
Sales	264.5	340.5	387.9
Sales Gr. %	0.8	0.3	0.1
EBITDA	59.6	73.5	80.3
EBITDA margin %	22.5	21.6	20.7
Adj. PAT	39.5	45.5	51.0
EPS (INR)	137.3	158.2	177.5
EPS Gr. (%)	110.9	15.2	12.2
BV/Sh. (INR)	463.3	617.5	791.0
Ratios			
ND/Equity	(0.4)	(0.0)	(0.1)
ND/EBITDA	(0.9)	(0.1)	(0.2)
RoE (%)	34.6	29.3	25.2
RoIC (%)	135.9	57.8	35.7
Valuations			
P/E (x)	24.5	21.3	19.0
EV/EBITDA (x)	15.4	13.1	11.9

Shareholding pattern (%)

As on	Sep-25	Jun-25	Sep-24
Promoter	64.2	64.3	64.3
DII	2.8	2.9	3.0
FII	6.4	2.7	2.2
Others	26.6	30.2	30.5

Note: FII includes depository receipts

Stock Performance (1-year)



CMP: INR3,370 TP: INR4,000 (+19%) Buy

Bellwether solar manufacturing play

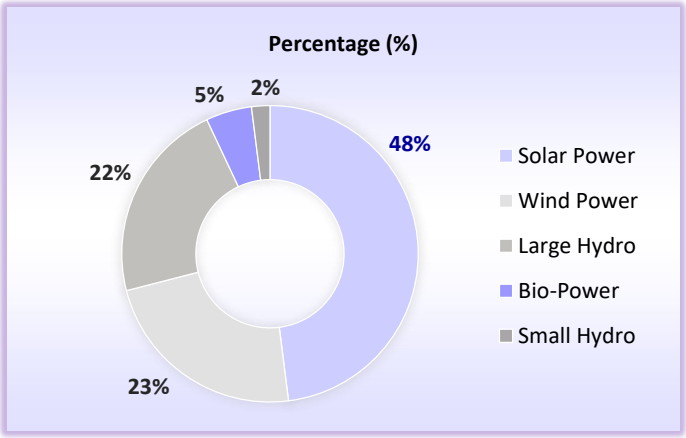
- **Play on India's solar scale-up; indigenization of clean power generation:** WEL encapsulates the India module story, with national installed solar capacity set to rise from 100GW in 1QFY26 to 160GW by FY28. A strong pickup in utility-scale bids (from 20 GW in FY23 to **69GW** in FY24) and accelerating demand from PM Kusum/Suryaghar Yojana will drive growth for the bread-and-butter domestic module business in FY26-27. Union government has displayed a strong intent to indigenize India's green power generation via regulations mandating domestically manufactured modules/cells.
- **Unique value proposition with industry-leading scale, speed, integration:** We initiate coverage on the solar cell and module manufacturing sector, with a Buy rating on Waaree Energies (WEL) and a TP of INR4,000. **Scale:** WEL boasts unmatched scale and is a bellwether in the Indian cell/module manufacturing space. With operational cell/module capacity of 5.4GW/16.1GW in India, WEL towers domestic competitors and enjoys a formidable India capacity market share of 21.6%/13.3%. **Speed:** WEL has responded swiftly to regulatory and macroeconomic changes as evidenced by its move to set up domestic cell capacity ahead of competitors in response to the government's approved list of cell manufacturers (ALCM) and the planned expansion of its US capacity from 2.6GW to 4.2GW (by 4QFY26) in response to the changing tariff landscape. **Integration:** Lastly, WEL's presence across the solar value chain (EPC, BESS, inverters, green hydrogen) makes it an integrated player and places it well to pursue growth relentlessly.
- **Multi-decade opportunity in solar manufacturing through 2030 and beyond:** India's installed solar capacity stood at 100 GW as of 1QFY26, against the central government's 280GW target by 2030, implying a substantial growth runway for the solar segment. Beyond 2030, we expect annual solar module demand of 50–60 GW, supported by rising power requirements and policy efforts to curb fossil fuel dependence. Upside to this estimate could arise from emerging applications such as green hydrogen, where project economics are steadily improving. Strong domestic demand for solar cells and modules also creates an enabling environment for 1) developing an export base once global tariff conditions turn favorable, and 2) capacity expansion in allied sectors such as batteries and inverters.
- **Ambitious government vision ably supported by favourable policies:** The central government, aiming to achieve 500 GW of renewable energy (RE) capacity by 2030 using domestically manufactured components, has introduced supportive policies such as the Approved List of Module Manufacturers (ALMM). An Approved List of Cell Manufacturers (ALCM) is proposed from June 2026, while an Approved List of Wafer Manufacturers (ALWM) has already been conceptualized. Industry participants also anticipate a similarly favorable policy framework for ancillary equipment including batteries, inverters, and transformers.
- **43% EBITDA CAGR (FY25-28) amid capacity expansion, new business start-up:** WEL plans to expand its total cell/module capacity from 5.4/18.7GW in 2QFY26 to 26.7GW/15.4GW/10GW module/cell/ingot-wafer capacity by FY26/FY27 end.

With a current order book of INR470b, earnings visibility for FY26-27 remains high. Management has guided for EBITDA of INR55-60b for FY26 (1HFY26: INR24b). As WEL expands capacity, we estimate a CAGR of 43% in EBITDA and 40% in PAT over FY25-28. By FY28E, the earnings contribution from new businesses is estimated to rise to 15% of EBITDA.

- **FY28 margin concerns offset by cell stabilization timelines, new segments:** We expect cell margins and pricing to remain resilient through FY27, supported by limited supply additions and elongated stabilization timelines for new capacity in the industry. While profitability is likely to stay firm in 1HFY28, we see potential margin pressure beyond FY28 as incremental cell capacity begins to align with demand. Meanwhile, emerging verticals such as battery energy storage systems (BESS), EPC, and green hydrogen are set to become key growth drivers, contributing an estimated ~15% of EBITDA by FY28E, thereby enhancing business diversification. Additionally, WEL's planned expansion of its U.S. module capacity to 4.2 GW by 4QFY26—with further scale-up expected—should provide a meaningful boost to growth and international presence.
- **Valuation: India's solar bellwether—strong growth visibility at 13x FY27 EV/EBITDA:** The valuation of WEL has been derived through a sum-of-the-parts (SoTP) methodology, resulting in a TP of INR4,000/share. The domestic module business is valued at 15x FY28E EBITDA, representing a premium to global peers. The US module business is valued at 12x FY28E EBITDA, which is in line with global peers. The new business segments, of which over 74% of the contribution is attributed to the EPC and O&M businesses, is valued at 11x FY28E EBITDA, consistent with domestic peer valuations. The sum of these segment valuations (adjusting for net debt) results in a TP of INR4,000/share, capturing a comprehensive value of WEL's diversified operations.
- **Upside risks:** 1) slower-than-expected ramp-up of industry cell capacity in FY27-28, 2) the government formalizing the localization directive for wafers and ingots (similar to ALCM).
- **Downside risks:** 1) Intensifying competition from large domestic players may pressure pricing and margins; 2) Heavy US market reliance heightens sensitivity to policy, tariff, and geopolitical shifts; 3) If backward integration initiatives (cells, ingot-wafer, and other upstream operations) fail to scale effectively, profitability and competitiveness may be undermined; 4) the company's aggressive foray into capital-intensive cell and ingot/wafer manufacturing increases exposure to execution and stabilization risks, potentially impacting timelines, costs, and near- to medium-term financial performance.

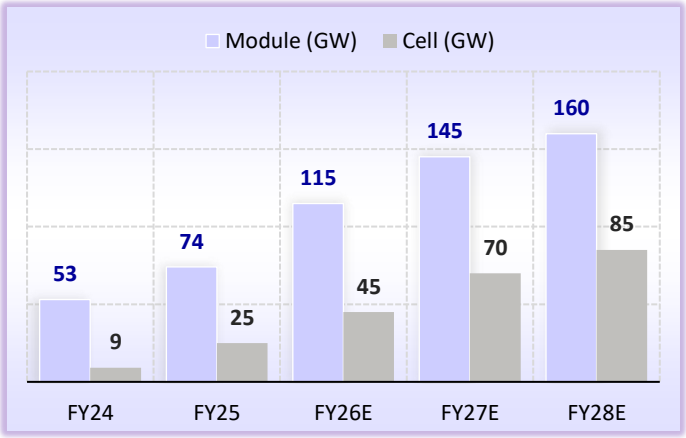
STORY IN CHARTS

India's installed 220GW RE capacity (Incl. Hydro) - July'25 end



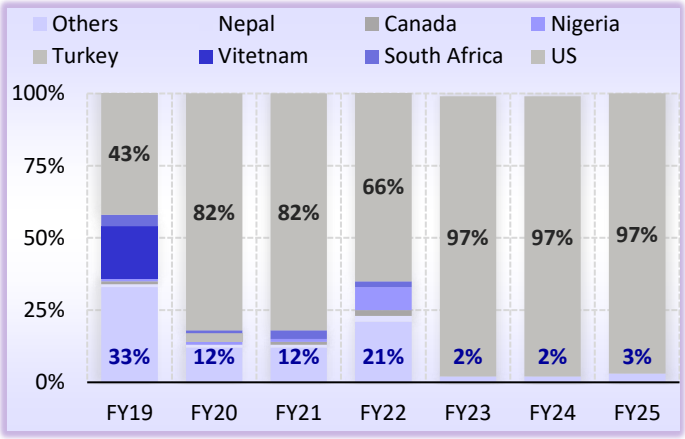
Source: CEA, MOFSL

India's module and cell manufacturing capacity



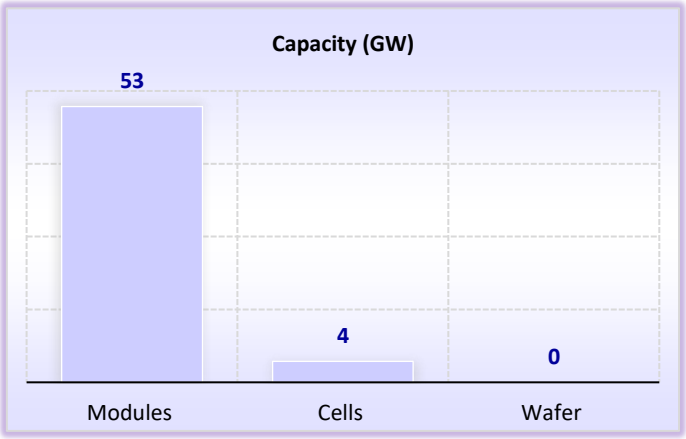
Source: MNRE. Company, MOFSL

India's solar module exports: Country-wise breakup (%)



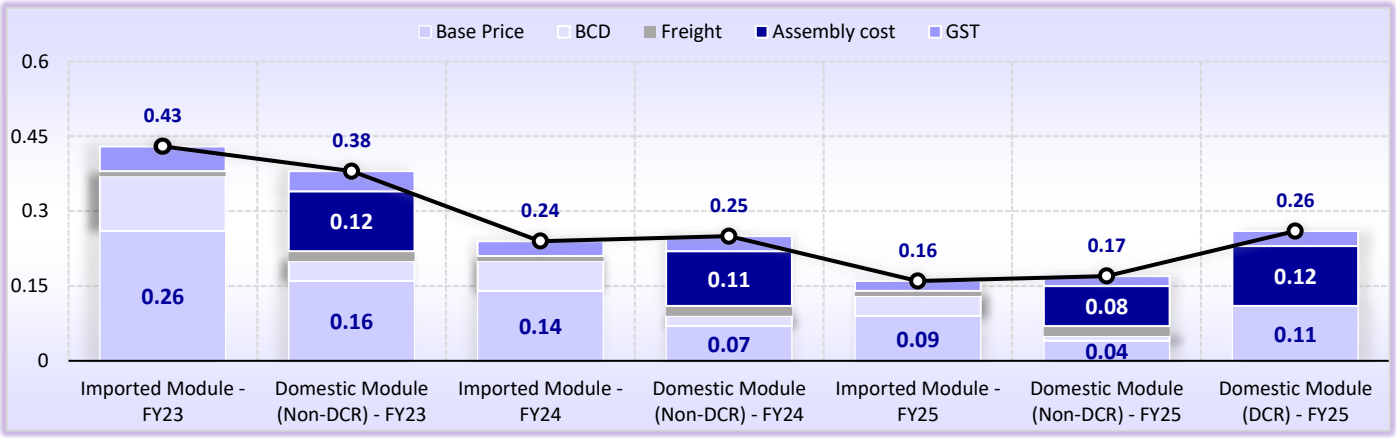
Source: Company, MOFSL

US manufacturing capacity as of May'25



Source: U.S. Department of Energy, MOFSL

Cost comparison of imported vs. domestic modules (DCR and non-DCR) (USD/Wp)



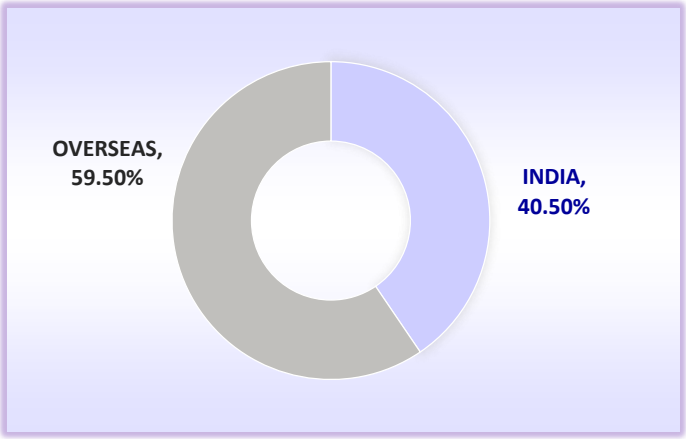
Source: Company, MOFSL

Solar market demand-supply dynamics in India (GW)

Particulars	FY21	FY22	FY23	FY24	FY25	FY26E	FY27E	FY28E	FY29E	FY30E
Demand										
India's Total Power Generating Capacity	382	399	416	442	475	515	560	615	670	735
Installed Solar Capacity	**40**	**54**	**67**	**82**	**106**	**133**	**163**	**196**	**234**	**276**
Total Incremental Solar Capacity (a+b+c+d)		14	13	15	24	27	30	34	38	42
(a) Competitively Bid Ground-Mounted						*16*	*17*	*20*	*23*	*26*
(b) Rooftop						*3*	*3*	*3*	*3*	*4*
(c) Open Access Ground-Mounted						*6*	*6*	*6*	*7*	*7*
(d) Solar Pumps						*3*	*4*	*5*	*5*	*5*
Total Manufacturing Capacities										
Module	12	21	38	53	74	115	145	160	165	180
Cell	3	3	7	9	25	45	70	85	85	90
Wafer	-	-	-	-	2	8	15	25	35	40
Polysilicon	-	-	-	-	-	-	5	10	15	20

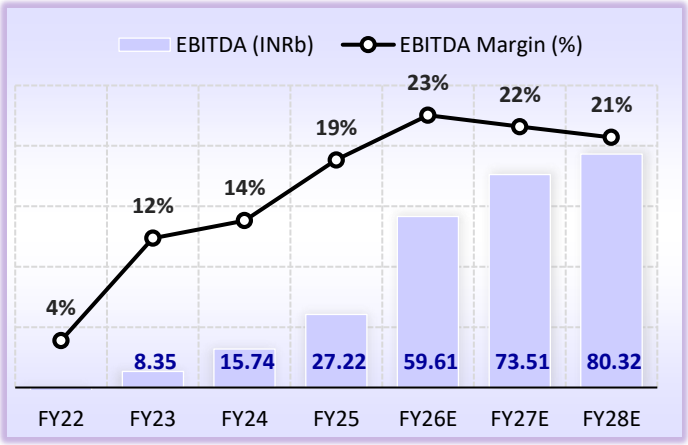
Source: CEA, Company, MOFSL

WEL's 24GW (INR470b) order book breakup (2QFY26 end)



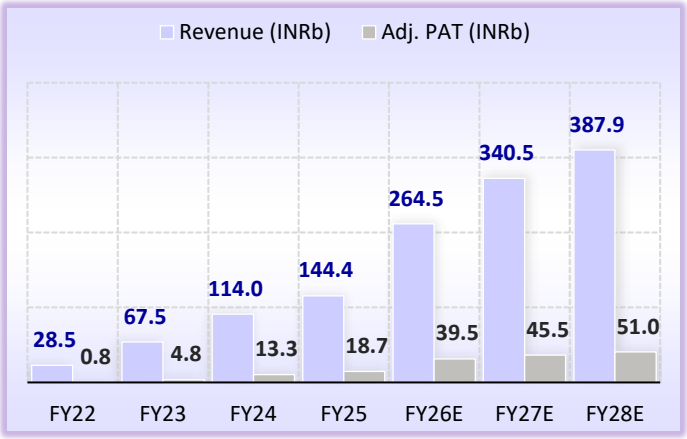
Source: Company, MOFSL

WEL's EBITDA and EBITDA margins



Source: Company, MOFSL

WEL's revenue/APAT



Source: Company, MOFSL

WEL's capacity to grow ~2x by FY27 (GW)

	Module	Cell	Ingot-Wafer
Current (Sep'25 end)	16.1 India 2.6 USA	5.4 India	-
Future	6 PLI	6 PLI	6 PLI
	2.05 (India/US)	4 (India)	4 (India)
Capacity	**26.7 (FY26)**	**15.4 (FY27)**	**10 (FY27)**

Source: Company, MOFSL

Investment initiatives across BESS, inverters and electrolysers

	Battery Energy Storage System	Inverters	Green Hydrogen Electrolyser
About	❖ Lithium-ion storage cell and energy storage system	❖ Renewable power projects and bidding pipeline	❖ Awarded PLI facility for a 300MW electrolyser manufacturing facility
Investment	❖ Up to INR20.73b	❖ Up to INR1.30b	❖ Up to INR 5.51b
Key Updates	❖ Plant capacity 3.5 Gwh, operational by FY27	❖ Plant capacity 0.3m inverters; 3GW p.a., operational in FY26	❖ Plant capacity: 300MW, operational by FY27
Current Status	❖ On track; Factory under construction at Valsad, Gujarat	❖ On track; Factory under construction at Valsad, Gujarat	❖ On track; Factory under construction at Valsad, Gujarat
Recent announcements	❖ Increased from 3.5GWh to 20GWh; additional capex ~INR80b	❖ Raised from 3GW to 4GW; capex of ~INR0.5b	❖ Increased from 300MW to 1,000MW; capex ~INR1.25b

Source: Company, MOFSL

WEL's SoTP-based valuation

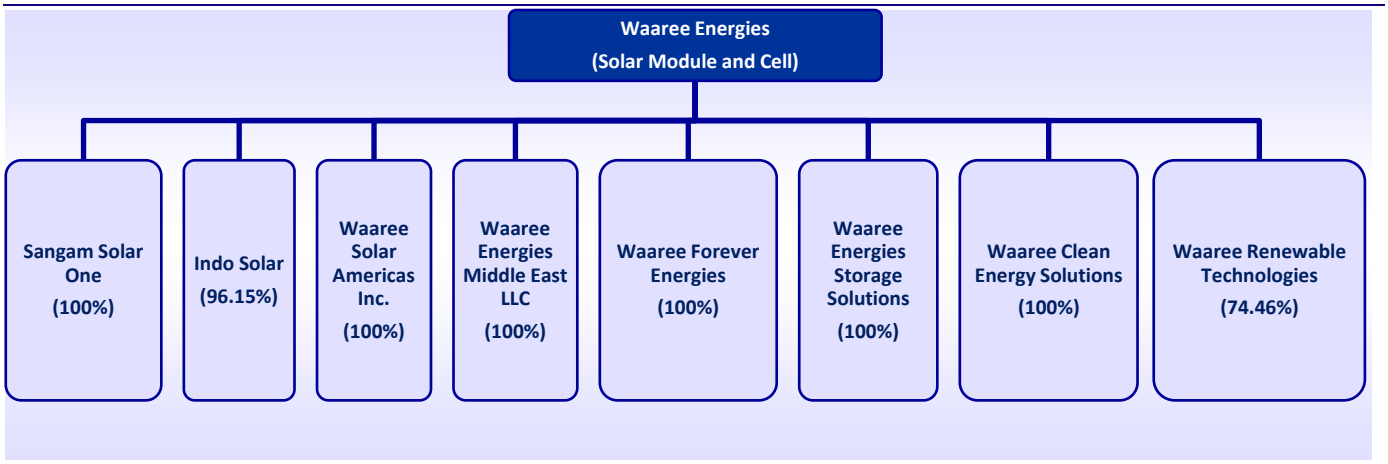
Segment	Unit	EBITDA (FY28E)	Multiple	EV	Comments
Domestic Modules	INR b	51	15	784	❖ Premium to global peers
USA Modules	INR b	18	12	224	❖ In line with global peers
New businesses	INR b	12	11	133	❖ In line with domestic peers
Total EV	**INR b**			**1,142**	
Minority Interest	INR b			5	
Net debt	INR b			-13	
Market Cap	**INR b**			**1,149**	
NOSH	m			287	
Target price	**INR**			**4,000**	
CMP	INR			3,370	
Upside / (Downside)	**%**			**19%**	

Source: Company, MOFSL

WEL: Bellwether module manufacturing play

- WEL, operational since 2007, has established itself as a leading player in India's solar energy sector and PV module manufacturing space, with the country's highest solar module manufacturing capacity of ~16.1GW.
- The company operates five facilities in India (16.1GW) spread across Chikhli, Surat, Tumb, Nandigram (Gujarat) and Noida, along with a 2.6 GW module manufacturing capacity in the US. WEL specializes in manufacturing of multicrystalline, monocrystalline, and TopCon modules, including flexible variants such as bifacial (Mono PERC), framed/unframed, and BIPV modules.
- Enhancing WEL's integrated presence in the solar value chain, its listed subsidiary, Waaree Renewable Technologies (WRTL), focuses on providing comprehensive engineering, procurement, and construction (EPC) and O&M services for solar energy projects. It has a proven track record with over 3GW of commissioned solar projects and oversees an O&M portfolio of ~769MW of solar assets.
- **Backward integration and expansion plans:** WEL has also strengthened its backward integration with 5.4GW of operational solar cell capacity (1.4GW MonoPERC and 4GW TopCon), which was commissioned in Mar'25 in Gujarat. Under the PLI scheme, the company is setting up a 6GW module and cell facility in Gujarat and a 6GW ingot-wafer facility in Maharashtra, with module targeted for commissioning by FY26 and cell by FY27. Additionally, the board has approved a capex outlay of INR27.5b to expand cell and ingot-wafer capacity by 4GW each, taking the total to 10GW each.
- Further diversifying its value proposition, WEL is expanding into green hydrogen business, renewable power infrastructure, lithium-ion battery storage, and inverters, reinforcing its commitment to the energy transition.
- **Product portfolio:** WEL offers a comprehensive range of solar PV modules, including multicrystalline, monocrystalline, high-efficiency TopCon, and flexible options like bifacial MonoPERC (framed/unframed) and BIPV modules.
  - Beyond modules, it also manufactures MonoPERC and TopCon cells and is expanding into green hydrogen solutions (electrolysers and related systems), inverters, and battery components such as cells, packs, and containers.
- **Service portfolio:** The company with its strong solar module manufacturing background, provides comprehensive O&M and EPC solutions across ground-mount, rooftop, and floating solar projects, positioning itself as a full-service renewable energy provider.
  - Furthermore, the company is establishing its presence in renewable power generation and renewable power infrastructure, aiming to participate in the 500 GW RE capacity target for 2030.

Exhibit 1: Group structure

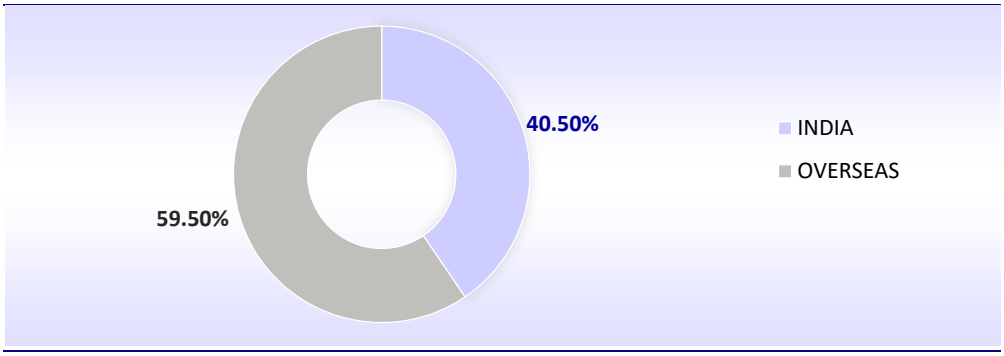


Source: Company, MOFSL

Solar market leader with robust ~24GW order book

- WEL has solidified its position as a leader in India's solar sector, accounting for ~17% of total solar module shipments in India in Jan-Mar'25. It boasts a robust consolidated order book of ~24GW (~INR470b) as of 2QFY26 end, including EPC and allied businesses, with ~40% of orders from India and the balance from international markets.
- The project pipeline remains robust at over 100GW, strategically aligned with India's national target of scaling up the installed solar capacity to 280GW by 2030.
- The US continues to be the largest export market, with utility-scale projects entailing longer gestation cycles (2-2.5 years), while Indian projects maintain relatively shorter timelines.
- The company is also exploring opportunities in the EU to expand its international footprint.

Exhibit 2: WEL's 24 GW (INR ~470b) order book breakup as of 2QFY26 end



Source: Company, MOFSL

Targeting 26.7GW module and 15GW cell capacity by FY26/FY27

- **Established leadership in solar manufacturing with 16.1GW capacity:** WEL has an installed module capacity of ~16.1GW as of 2QFY26 end, spread across five domestic facilities. On the cell front, the company commissioned 5.4 GW of capacity at its Chikli (Gujarat) facility in FY25, comprising 1.4 GW MonoPERC and 4 GW TopCon technologies. In parallel, WEL continues to expand across the broader solar value chain.

- **Shift from Odisha to Gujarat and Maharashtra facilities:** WEL had initially announced plans to establish a large-scale solar equipment manufacturing facility in Odisha, spread across 595 acres, with a planned commissioning timeline of 2027 and an envisaged capacity of 6 GW. However, the company has since revised its strategy and is now executing a 6 GW integrated module and cell facility in Gujarat while developing an ingot-wafer manufacturing unit at Butibori (Nagpur, Maharashtra). Both projects are expected to be commissioned by FY26-27.
- Execution progress has been notable, with the 6 GW module expansion in Gujarat being developed at a retrofitted facility. Cell manufacturing capacity near the Chikli giga-campus is also under construction, with land and other key permits secured. Meanwhile, engineering work for the ingot-wafer facility in Maharashtra is complete, with land preparation activities underway.
- **INR27.5b capex to enhance cell and wafer capacity by 4GW each:** WEL has received its board's approval for incremental capex of INR27.5b to enhance cell and ingot-wafer capacities by 4GW each.
- **Capacity targets by FY27:** By 2027, WEL is targeting an integrated capacity of 26.7GW for modules, 15.4GW for cells, 10 GW for ingots and wafers, 3.5 GWh for batteries, and 3 GW for inverters. Through this comprehensive capacity build-out across modules, cells, ingots, wafers, batteries, and inverters, WEL is positioning itself as a fully integrated solar solutions provider.

Exhibit 3: WEL's capacity to grow ~2x by FY27E

	Module	Cell	Ingot-Wafer
Current (Sep'25 end)	16.1 India 2.6 USA	5.4 India	-
Future	6 PLI	6 PLI	6 PLI
	2.05 (India/US)	4 (India)	4 (India)
Capacity	**26.7 (FY26)**	**15.4 (FY27)**	**10 (FY27)**

Source: Company, MOFSL

Expand wallet share; build overseas business

- WEL has ~40- 45% wallet share in core solar modules and is expanding into adjacencies such as inverters, BESS, hydrogen electrolysers, and power infrastructure, targeting an 85-90% wallet share through full-stack energy solutions.
- Integration of land and connectivity enhances eligibility in turnkey projects and tenders. The company follows a 'book and build' approach, adding capacity only against firm bookings. Retail contributes ~23-25% of revenues, providing a stable mix.
- Overseas, revenue is expected to sustainably contribute 10-14% of consolidated sales. In the US, demand is being driven by AI-led data center consumption (expected to grow from 2.2% of total power currently to ~7.5-8% by 2030), manufacturing re-shoring, and transport electrification.
- WEL has a 2.6 GW capacity and further increasing its US capacity to 4.2GW. Beyond the US, the company is evaluating opportunities in EU (Germany, Italy, etc.), while EPC growth prospects are strong in the Middle East, Africa, and Australia.

Scaling across new energy verticals

- WEL is entering the BESS, green hydrogen (electrolyser manufacturing) and inverter verticals. As these businesses scale up, we are building in a contribution of ~15% in FY28 EBITDA on a combined basis.

Exhibit 4: Investment initiatives across BESS, inverters and electrolysers

	Battery Energy Storage System	Inverters	Green Hydrogen Electrolyser
About	❖ Lithium-ion storage cell and energy storage system	❖ Renewable power projects and bidding pipeline	❖ Awarded PLI facility for a 300MW electrolyser manufacturing facility
Investment	❖ Up to INR20.73b	❖ Up to INR1.30b	❖ Up to INR 5.51b
Key Updates	❖ Plant capacity 3.5 Gwh, operational by FY27	❖ Plant capacity 0.3m inverters; 3GW p.a., operational in FY26	❖ Plant capacity: 300MW, operational by FY27
Current Status	❖ On track; Factory under construction at Valsad, Gujarat	❖ On track; Factory under construction at Valsad, Gujarat	❖ On track; Factory under construction at Valsad, Gujarat
Recent announcements	❖ Increased from 3.5GWh to 20GWh; additional capex ~INR80b	❖ Raised from 3GW to 4GW; capex of ~INR0.5b	❖ Increased from 300MW to 1,000MW; capex of ~INR1.25b

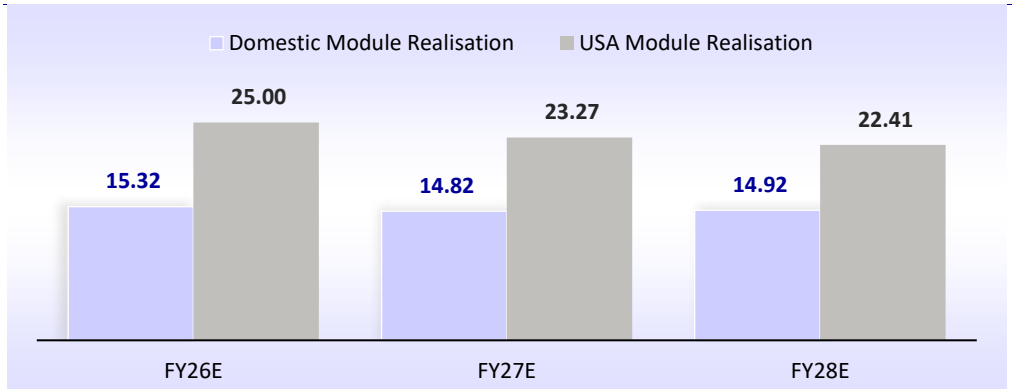
Source: Company, MOFSL

- **Technology transition:** WEL is migrating toward tunnel oxide passivated contact (TOPCon) technology, which is expected to become the dominant photovoltaic technology by 2026, while Mono PERC is set to gradually decline. Heterojunction (HJT) adoption is likely to gain traction after 2027. Although TOPCon involves ~15-20% higher capex, it is increasingly emerging as the global industry standard.
- **Battery energy storage:** With rising RE penetration, grid stability and round-the-clock power supply require energy storage solutions. Supported by government mandates and declining battery costs, WEL is expanding into this space through a 3.5 GWh BESS facility near Chikhli, targeted for commissioning by FY27. Recently, WEL announced an enhancement of this project's capacity from 3.5 GWh to 20 GWh.
- **Inverter manufacturing:** WEL is establishing a 3 GW inverter facility, expected to go live in FY26. This addition enhances its integrated offerings across the solar value chain. Recently, the company announced an expansion of this facility's capacity from 3GW to 4GW, with an additional investment of ~INR0.5b in its wholly owned subsidiary, Waaree Power Pvt. Ltd.
- **Hydrogen electrolysers:** The company is also venturing into green hydrogen by setting up a 300 MW electrolyser manufacturing plant, scheduled for commissioning in FY27, in alignment with India's energy transition objectives.

Revenue/APAT CAGR of 39/40% driven by capacity expansion

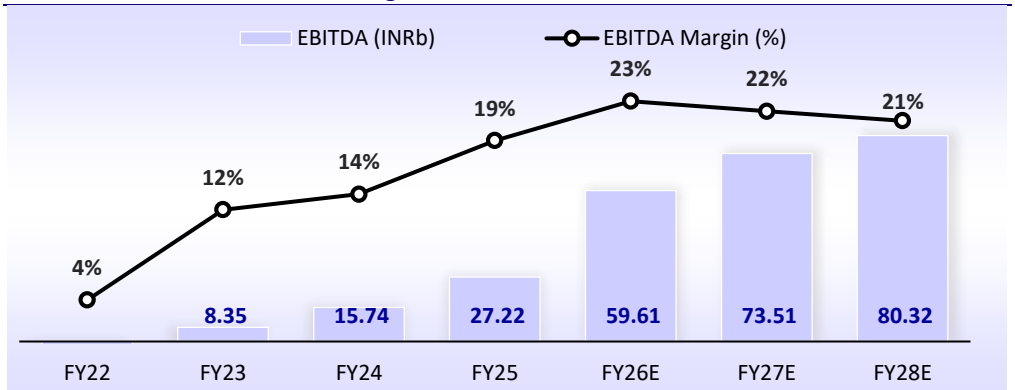
- **Building in EBITDA CAGR of 43% on the back of capacity expansion:** WEL delivered a consolidated EBITDA (incl. Other Income) margin of 25.8% in 2QFY26, marking an improvement of +860bps YoY. This margin stability is underpinned by the company's strategy of locking in raw material costs against confirmed orders, mitigating the impact of declining module prices.
- For FY26, management has guided for EBITDA in the range of INR55-60b. We estimate EBITDA at INR59.6b/INR73.5b/80.3b in FY26E/FY27E/FY28E, translating into a CAGR of 43% over FY25-28E, driven by incremental capacity additions. We expect EBITDA margin to expand from 19% in FY25 to 21% by FY28.

Exhibit 5: Estimated domestic (blended) and US module realisations (INR/Wp)



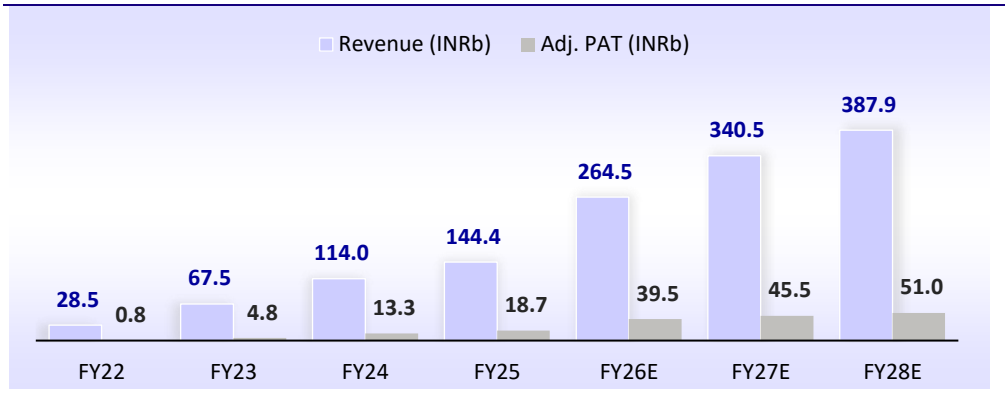
Source: MOFSL

Exhibit 6: EBITDA and EBITDA margins



Source: Company, MOFSL

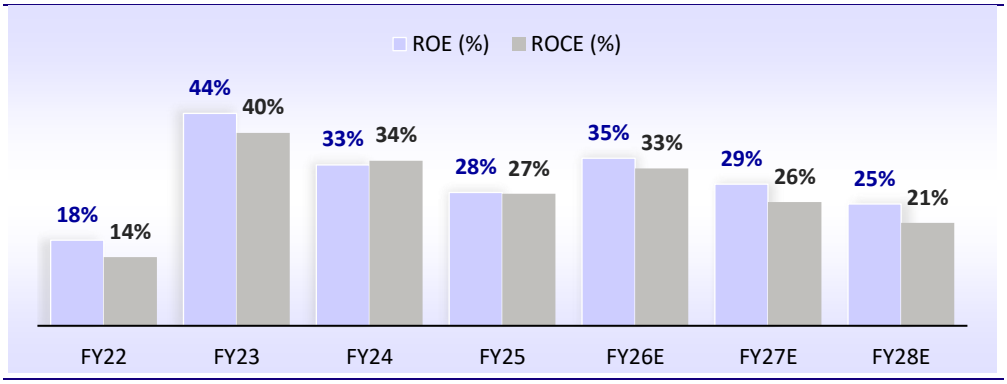
Exhibit 7: Revenue/APAT over FY22-28E



Source: Company, MOFSL

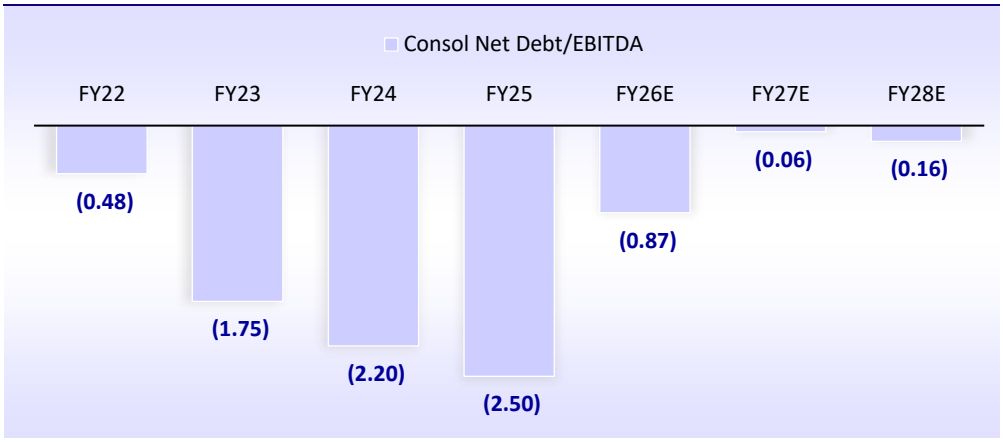
- **Deploying INR250b capex over FY26-28:** The Company has outlined a planned capex of ~INR250b over FY26-28 for integrated manufacturing facilities and new business initiatives. Funding is expected to be comfortably managed through existing cash reserves, internal accruals, and bank facilities, ensuring a largely debt-free balance sheet in the near term.
- **Financial projections and operating efficiency:** Revenue/APAT CAGRs for FY25-28 are estimated at 39%/40%, supported by scaling integrated capacity. Effective domestic module capacity in India is estimated at 17.4GW/21.6GW in FY26/FY27, with utilization rates of 78%/72%.
- EBITDA margins for domestic operations are expected at ~23%/22% in FY26/FY27, while the US facility is anticipated to deliver higher margins at ~25%/28% over the same period.
- **RoE/RoCE remain strong with gradual net debt build-up:** The company has delivered robust returns, with RoE of ~28% and post-tax RoCE of ~27% in FY25. We project RoE of 35%/29% for FY26/FY27, while we expect RoCE to rise to 33% in FY26, before falling to 26% in FY27, factoring in the elevated capex cycle. The company has historically maintained a net cash position and is expected to remain net cash in FY26/27 as well.

Exhibit 8: RoE/RoCE (post-tax) over the years



Source: Company, MOFSL

Exhibit 9: Net Debt/EBITDA (FY22-28E)



Source: Company, MOFSL

- **Strong working capital efficiency:** WEL has historically operated with a very short working capital cycle vs. its peers, aided by advance customer payments and letter of credit–backed sales. Its lean operating model, characterized by minimal inventory holding, ensures limited working capital requirements. Working capital days stood at 54/20 in FY24/25, and we expect them to be around 20 going forward as well, reflecting continued efficiency in operations.

Exhibit 10: Debtor, inventory, payable and working capital days (FY22-FY28E)

Working Capital Ratios	FY22	FY23	FY24	FY25	FY26E	FY27E	FY28E
Debtor (Days)	12	17	31	30	30	30	30
Inventory (Days)	69	146	83	68	70	70	70
Payable (Days)	82	98	60	78	80	80	80
Working Capital (Days)	-1	65	54	20	20	20	20

Source: Company, MOFSL

Valuation and view

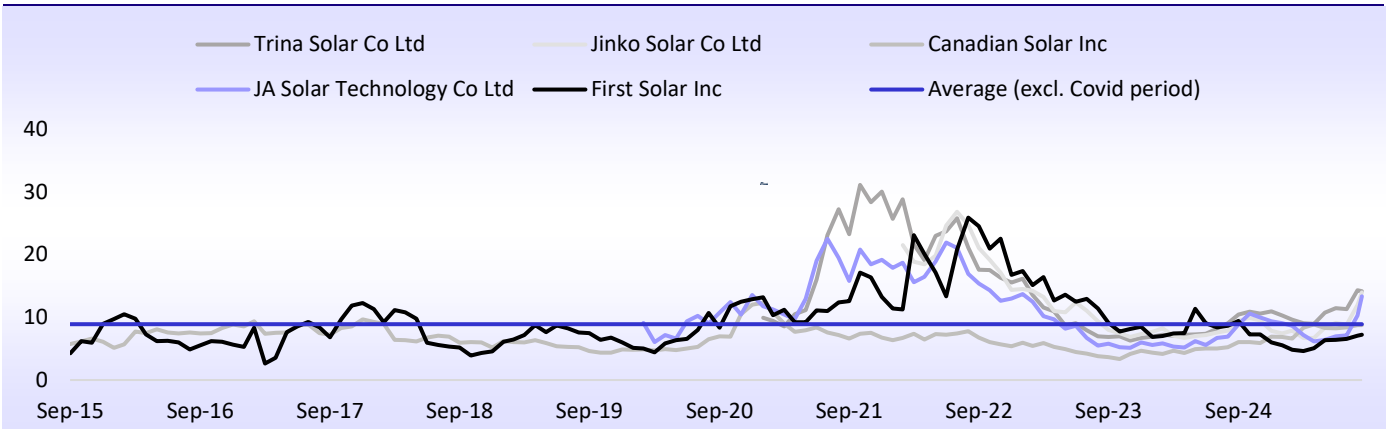
- The valuation of WEL has been derived through a sum-of-the-parts (SoTP) methodology, resulting in a TP of INR4,000/share. The domestic module business is valued at 15x FY28E EBITDA, representing a premium to global peers. The US module business is valued at 12x FY28E EBITDA, which is in line with global peers. The new business segment, of which over 74% of the contribution is attributed to the EPC and O&M businesses, is valued at 11x FY28E EBITDA, consistent with domestic peer valuations. The sum of these segment valuations (adjusting for net debt) results in a TP of INR4,000/share, capturing a comprehensive value of WEL's diversified operations.
- Valuations for domestic solar cell and manufacturing companies remain at a significant premium to global peers, given 1) stronger near-term EBITDA margins, 2) robust new order outlook given India's 500 GW RE target by 2030, and 3) overall lower free-float given high promoter holdings. By FY28, though, as domestic cell capacity ramps up and players achieve stabilization of output, we expect EBITDA margins and realizations in the DCR segment to normalize at a lower level.

Exhibit 11: SoTP-based valuation

Segment	Unit	EBITDA (FY28E)	Multiple	EV	Comments
Domestic Modules	INR b	51	15	784	❖ Premium to global peers
USA Modules	INR b	18	12	224	❖ In line with global peers
New businesses	INR b	12	11	133	❖ In line with domestic peers
Total EV	**INR b**			**1,142**	
Minority Interest	INR b			5	
Net debt	INR b			-13	
Market Cap	**INR b**			**1,149**	
NOSH	m			287	
Target price	**INR**			**4,000**	
CMP	INR			3,370	
Upside / (Downside)	**%**			**19%**	

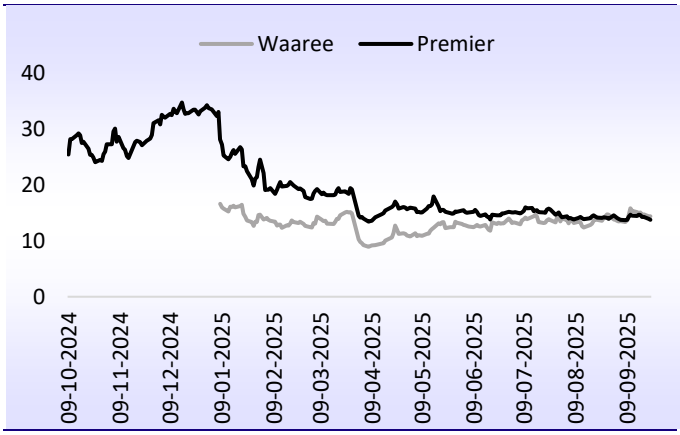
Source: Company, MOFSL

Exhibit 12: 1yr fwd EV/EBITDA (x) of Global Peers



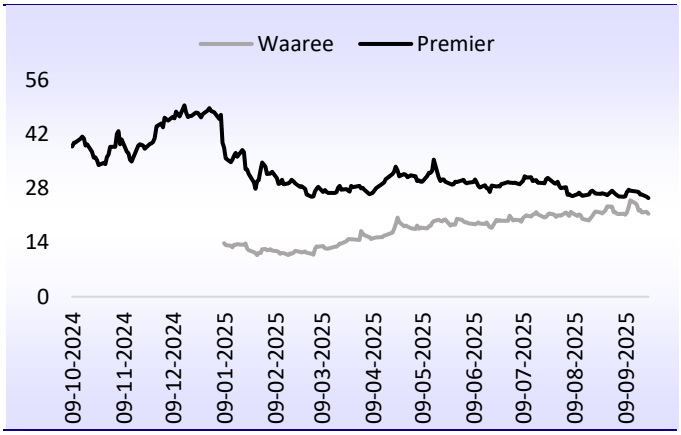
Source: Company, MOFSL

Exhibit 13: 1yr fwd EV/EBITDA (x) of domestic players



Source: Bloomberg, MOFSL

Exhibit 14: 1yr fwd P/E Ratio (x) of domestic players



Source: Bloomberg, MOFSL

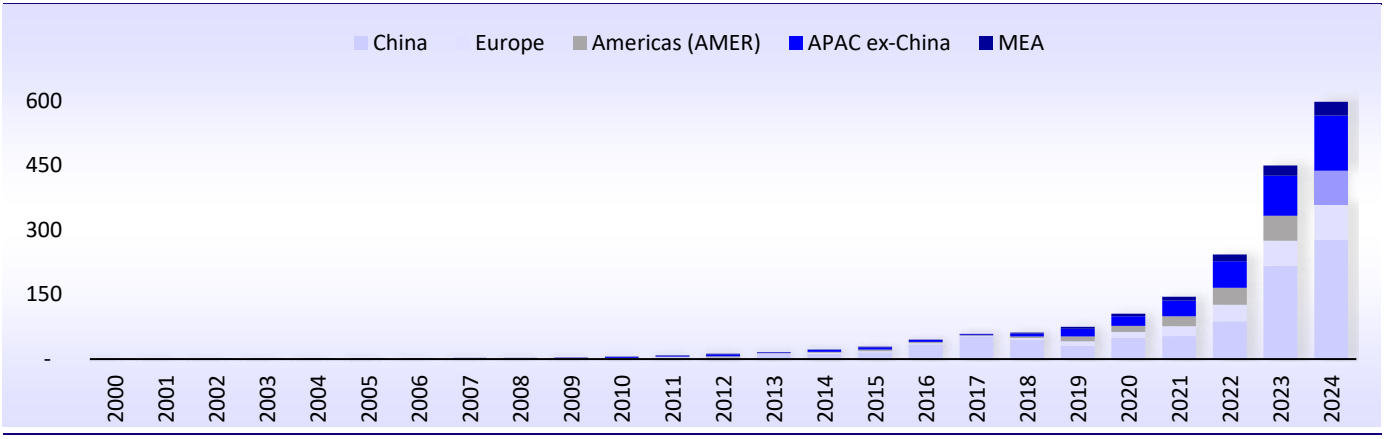
Risks

- **Project execution risk:** Large-scale expansion across multiple verticals — modules, cells, ingot-wafer, BESS, inverters, green hydrogen, and renewable infrastructure — exposes the company to execution, stabilization, and integration challenges.
- **Raw material price volatility:** Rising prices of critical inputs such as polysilicon, cells, and glass could compress margins despite indexed pricing mechanisms.
- **Competitive pressure:** Intensifying competition from large domestic players such as Reliance and Adani may erode pricing power and margins.
- **Foreign exchange risk:** With significant imports and exports denominated in USD, WEL faces exposure to exchange rate volatility, which could affect raw material costs and export profitability, despite hedging strategies.
- **Tariff and regulatory uncertainty:** Possible US policy changes related to the Inflation Reduction Act (IRA) or tariff actions on Indian exports could dent realizations. Any rollback or delay in PLI disbursements or withdrawal of supportive policies in key markets could affect expansion plans.
- **Overcapacity risk:** With multiple players aggressively expanding capacities, the industry could face oversupply, leading to margin compression and low plant utilization.
- **Diversification complexity:** Pursuing multiple verticals may dilute management focus, increase execution complexity, and strain organizational bandwidth.
- **US market exposure:** Significant presence in the highly regulated US market increases vulnerability to changes in trade policies, subsidies, tariffs, and geopolitical developments. Any delays or challenges in stabilizing local operations could adversely impact brand credibility and financial performance.
- **Warranty obligations:** WEL provides a 12-year product warranty and a 30-year performance warranty on modules, despite the product not having a proven 30-year track record. Warranty claims may require repair, replacement, or refunds, creating a long-tail liability that could pressure future cash flows.
- **Backward integration risk:** If backward integration initiatives (cells, ingot-wafer, and other upstream operations) fail to scale effectively, profitability and competitiveness may be undermined.

2.2TW and rising: The solar age accelerates

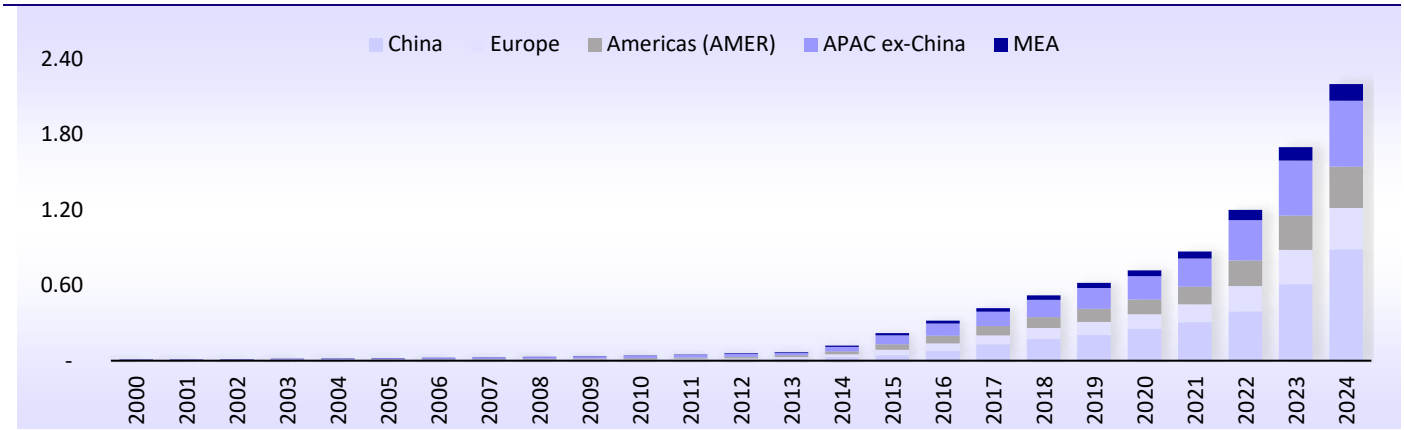
- **Strong growth ahead, supply adequate:** Despite potential headwinds, global solar capacity is poised for substantial growth. Under SolarPower Europe's low scenario, annual installations are expected to rise from 597GW in 2024 to 700GW by 2029, increasing the cumulative capacity from 2.2TW to 5.3TW, while the high scenario could see total capacity reach 7.2TW, with annual additions exceeding 1TW if favorable policies and cost dynamics persist. On the supply side, IEA data indicates that global PV manufacturing capacity of 1,155GW (modules), 1,135GW (cells), 902GW (wafers), and 855GW (polysilicon) as of 2023 (predominantly in China) is projected to expand to 1,546/1,404/961/ 1,293GW by 2035. Importantly, existing module and cell capacities already exceed the 674GW annual demand projected by IEA's APS (announced pledges scenario) for 2035, suggesting that manufacturing will remain sufficient, with future solar growth hinging more on policy stability, trade dynamics, and infrastructure readiness than supply constraints.
- **Solar is the fastest-growing RE electricity source:** Solar PV remained the powerhouse of global renewable energy expansion in 2024, securing its place as the fastest-growing renewable electricity source for the 20th consecutive year. Of the estimated 735GW of new renewable capacity added globally, solar PV contributed 597GW, representing a dominant 81% share.
- **Globally, 1 TW of capacity addition in CY24:** This surge propelled global cumulative solar PV capacity to 2.2TW by Dec'24, up 36% from 1.6TW installed capacity in 2023. While it took 68 years to reach the first terawatt in 2022, the world added the second terawatt in just two years, underscoring the accelerating pace of solar deployment.
- **China, US, India leading the solar charge:** China has been leading this rapid growth, installing 329GW in 2024 alone, capturing 55% of the global market—more than six times the 50GW added by the US, which posted a strong 54% increase to secure the second place**.** India's installations surged 145% to 30.7GW, reclaiming the third place and pushing Brazil (18.9GW) and Germany (17.4GW) down the rankings.
- **RE now supplies 1/3rd of global electricity:** Renewable energy sources supplied 31.9% of global electricity generation in 2024, an all-time high. Solar PV alone generated 2,000TWh, a landmark figure roughly equivalent to India's total annual electricity consumption, highlighting its growing role in the global energy mix.

Exhibit 15: Annual solar installed capacity added from 2000 to 2024 (in GW)



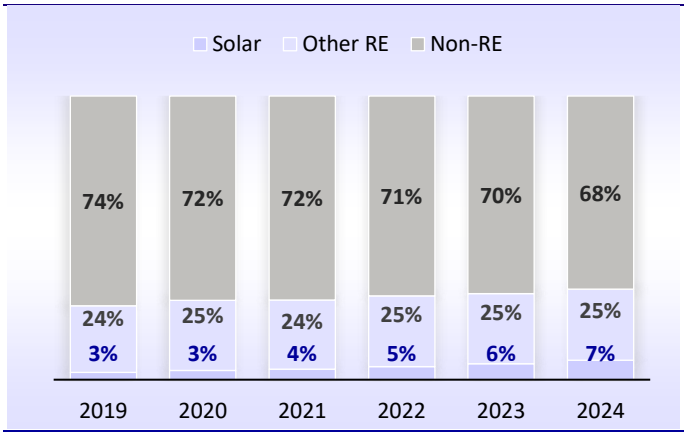
Source: SolarPower Europe, MOFSL

Exhibit 16: Cumulative solar installed capacity from 2000 to 2024 (in TW)



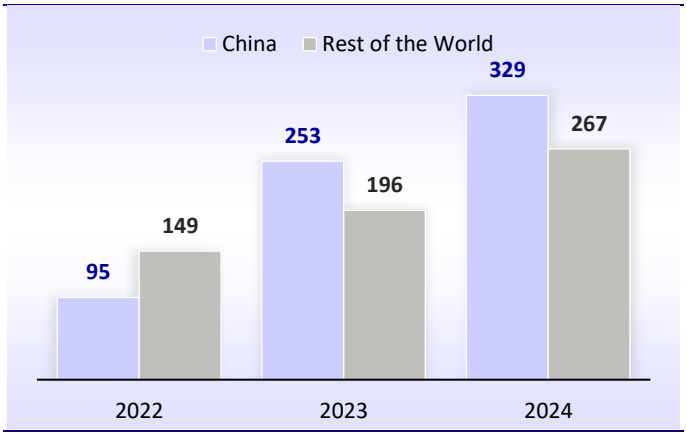
Source: SolarPower Europe, MOFSL

Exhibit 17: Share of solar/ renewable in global electricity generation



Source: SolarPower Europe, MOFSL

Exhibit 18: Global solar capacity installed China vs. Rest of the World (GW)

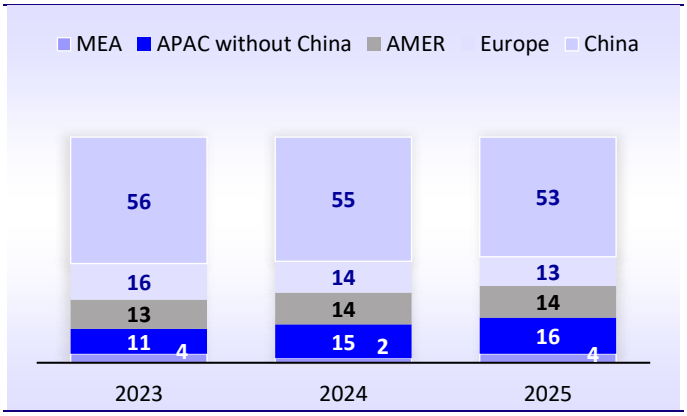


Source: SolarPower Europe, MOFSL

Well-equipped to meet future requirements

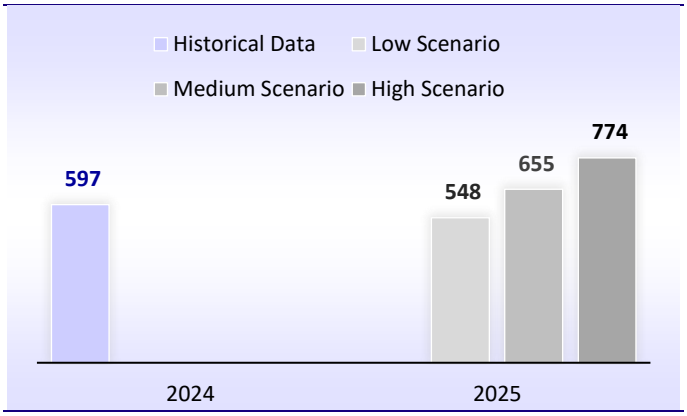
- **Solar expansion meets infrastructure and policy risks:** In 2025, growth in installed solar PV capacity will continue to be driven by China and its cost advantages, though mounting political, economic, and geopolitical pressures are increasing market uncertainty. Growth is set to slow, underscoring the urgent need for enhanced grid flexibility as underinvestment and aging infrastructure lead to rising curtailment and negative pricing, threatening the profitability of new projects.
- **10% gain forecast under base case:** Despite these challenges, the global solar market is forecast to expand by 10% to 655GW in CY25 under SolarPower Europe's medium scenario, slowing from 85% growth in 2023 and 33% in 2024. However, growth risks persist. Policy changes in China and the US could dampen momentum, while fragmented EU policies risk market contraction. The low scenario projects an 8% decline to 548GW, whereas the high scenario projects a 30% surge to 774GW, driven by sustained low costs and a potential stimulus in China.

Exhibit 19: Regional share in global solar PV installed capacity (%)



Source: SolarPower Europe, MOFSL

Exhibit 20: Global solar PV installations for 2025 (GW)

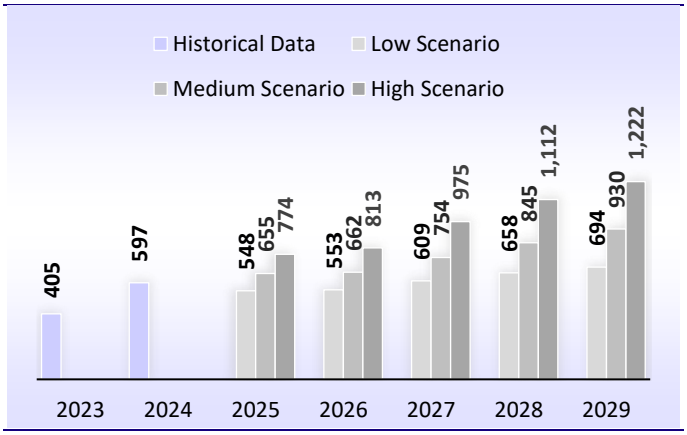


Source: SolarPower Europe, MOFSL

- **Bright future, cloudy present:** According to SolarPower Europe, the global solar PV market is expected to maintain strong momentum through 2029, supported by continued cost reductions, abundant product supply, and robust demand, particularly from China. However, growing geopolitical tensions, economic volatility, and inconsistent policy environments in key markets are increasing uncertainty.
  - Notably, growth in the solar sector in 2026 is forecast to slow sharply to just 1%, largely due to China's policy shift from feed-in tariffs to market-based pricing, which may delay project timelines. The US market also faces a projected 8% decline in 2026 installations due to lingering policy uncertainty.
- **Global installed solar capacity likely to exceed 5TW by 2029:** Despite these headwinds, SolarPower Europe's medium scenario projects global annual solar installations to rise from 597GW in 2024 to 930GW by 2029, pushing total installed solar capacity from 2.2TW in 2024 to 6.1TW, nearly triple the current levels. Under the high scenario, accelerated policy support and infrastructure investment could see annual solar capacity additions surpass 1TW by 2028, with cumulative installed solar capacity reaching 7.2TW. In contrast, the low

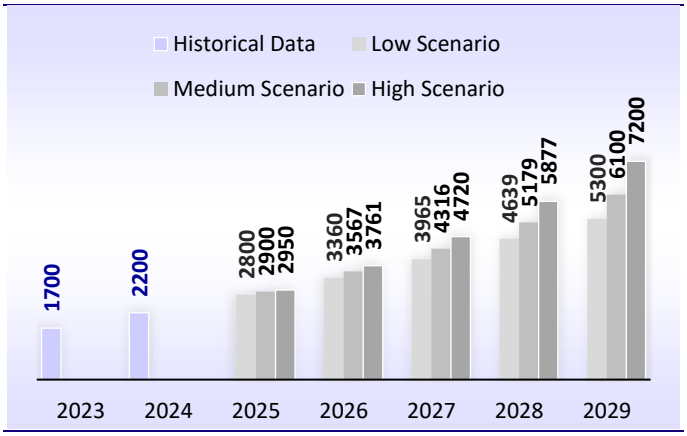
scenario, shaped by delayed reforms and trade barriers, forecasts slower growth, with annual solar installations limited to 0.7TW by 2029 and total installed solar capacity reaching 5.3TW.

Exhibit 21: Global solar capacity installations (GW)



Source: SolarPower Europe, MOFSL

Exhibit 22: Global total installed solar capacity (GW)



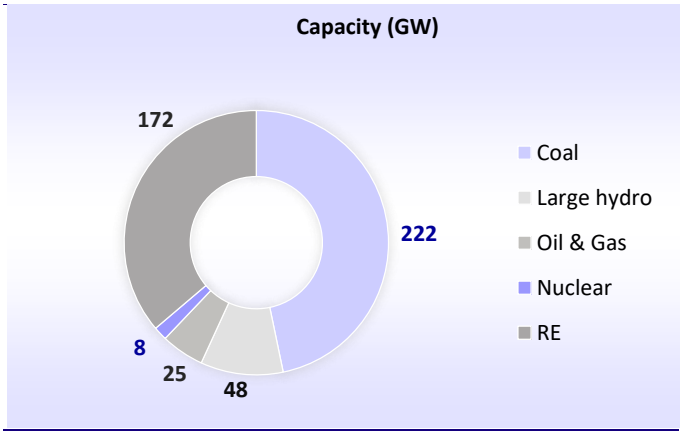
Source: SolarPower Europe, MOFSL

- **Global solar supply set to expand sharply:** According to the IEA, as of 2023, global manufacturing capacities for solar PV stood at 1,155/1,135/902/855 GW for modules/cells/wafers/polysilicon, with the majority concentrated in China. Under the IEA's Stated Policies Scenario (STEPS - Energy outlook based on policies and clean tech plans as of Aug'24), these capacities are expected to increase to 1,546/1,404/961/1,293 GW by 2035, implying a CAGR of 2.5/1.8/0.5/3.5% for modules/cells/wafers/polysilicon.
- **Current solar module supply adequate for 2035 ambitions**: As per IEA, existing global manufacturing capacities for solar PV modules and cells are sufficient to meet the 674GW module demand projected under the IEA's Announced Pledges Scenario (APS - Assumes all global climate commitments are fully met) by 2035, and are nearly adequate for IEA's more ambitious Net Zero emission scenario (NZE - Scenario charts net-zero energy emissions by 2050). While China is expected to maintain its leadership in solar PV manufacturing, its global share will decline marginally by 2035 as the US, India, and the EU scale up domestic production, supported by targeted industrial policies and growing investments.

India joins the 100GW solar capacity club

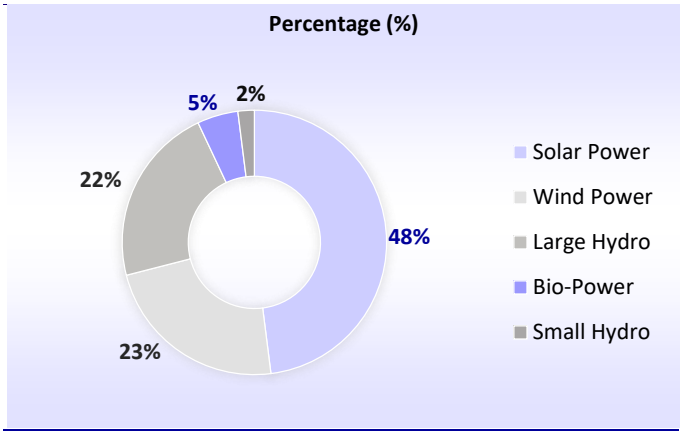
- **Solar installed capacity growing at 25% CAGR (FY20-25):** India's overall power generation capacity stood at 475GW as of Jul'25, with renewable energy (including large hydro) accounting for roughly 220GW, representing 46% of the total capacity. Solar power has emerged as the driving force behind India's renewable energy growth, registering an impressive CAGR of 25% between FY20 and FY25 and surpassing 100 GW in cumulative installed capacity. In FY24-25 alone, solar additions surged to nearly 21GW, up significantly from about 15 GW the previous year. By Aug'25, total installed solar capacity reached 100+GW, comprising 81GW of ground-mounted systems, 17GW of rooftop installations, 3GW of hybrid projects, and 5GW of off-grid solar, reflecting robust growth across both utility-scale and distributed segments.
- **Strong power demand driving installed base expansion:** Energy demand has steadily risen alongside capacity, with a CAGR of 4.7% in generation and 5.6% in consumption over the past five years. This growth is supported by improved power availability, expanded electricity access, rapid urbanization, and government initiatives aimed at delivering reliable 24x7 power supply.
- **Solar now accounts for ~7% of India's power generation:** Solar power generation in India has also quadrupled from FY18 to FY23, surpassing 100 billion units (BUs) and increasing its share in total electricity generation from 2.0% to 6.3%. In FY24, it rose further by 14% to 116BUs (6.7% share). With rapid capacity additions underway, solar generation is projected to exceed 300BUs by FY28, contributing around 14% to total electricity output.

Exhibit 23: India's total installed capacity at Jul'25 end (GW)



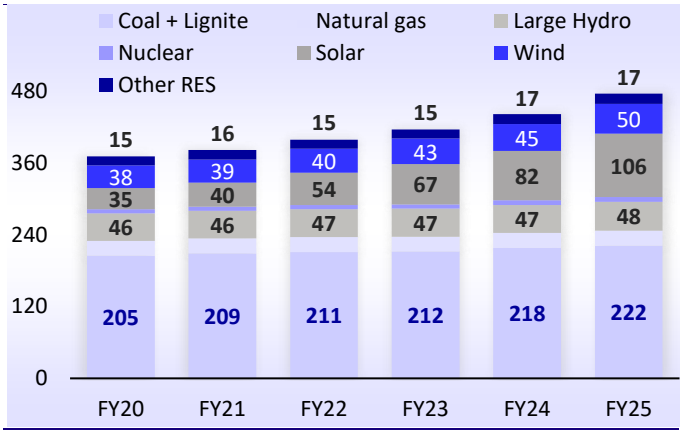
Source: National Power Portal, MOFSL

Exhibit 24: India's installed 220GW RE capacity break-up



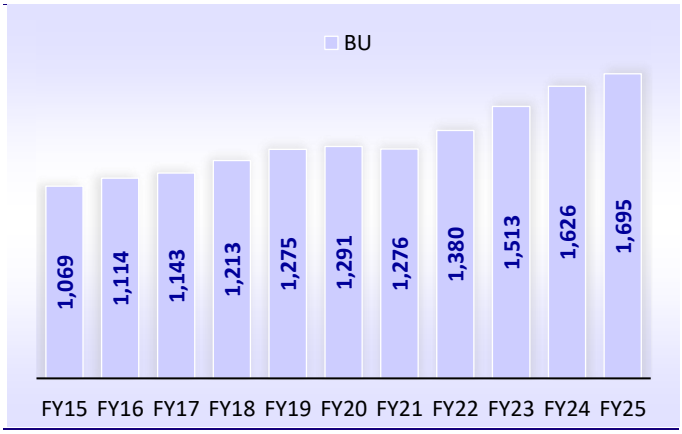
Source: CEA, MOFSL

Exhibit 25: India's installed capacity trend (GW)



Source: National Power Portal, MOFSL

Exhibit 26: Evolution of energy requirements in India (BUs)



Source: National Power Portal, MOFSL

Adequate output, but consumption-side challenges continue

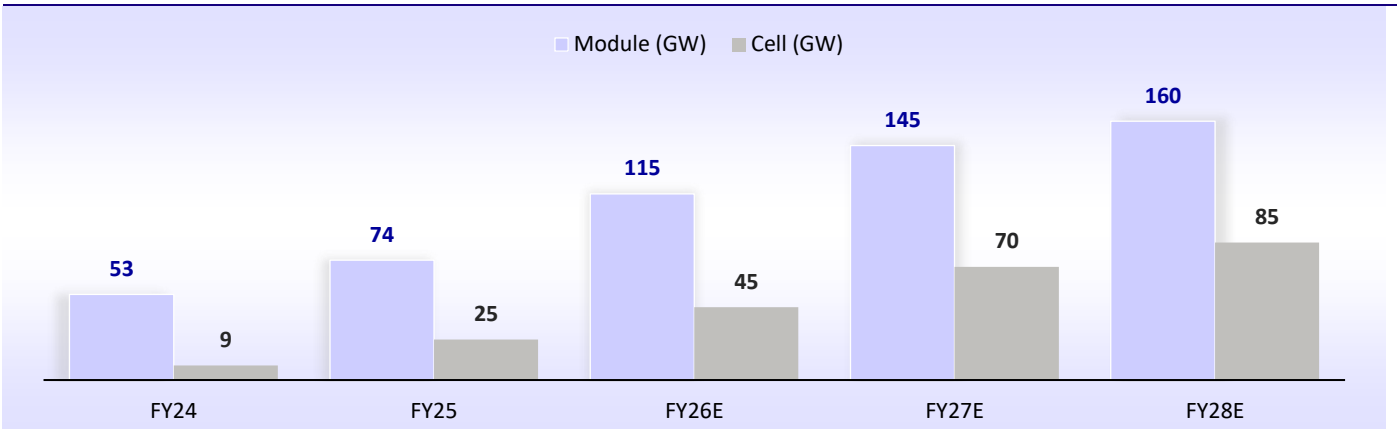
- **India aims to triple solar installed capacity to 300GW by 2030:** According to the 20th Electric Power Survey, India's peak electricity demand is expected to rise to ~295GW by FY28 and ~366GW by FY32. To meet this growing demand, the government has set a target of 500GW of clean energy capacity by CY30, with solar contributing 300GW.
  - To support this goal, the Ministry of New and Renewable Energy (MNRE) has outlined plans to conduct annual renewable energy auctions totaling 50GW, with solar expected to account for 80% of the capacity. This could effectively double India's annual solar additions over the next 2-3 years, driving total installed solar capacity to an estimated ~200GW by FY28.

Exhibit 27: Solar market demand-supply dynamics in India (GW)

Particulars	FY21	FY22	FY23	FY24	FY25	FY26E	FY27E	FY28E	FY29E	FY30E
Demand										
India's Total Power Generating Capacity	382	399	416	442	475	515	560	615	670	735
Installed Solar Capacity	**40**	**54**	**67**	**82**	**106**	**133**	**163**	**196**	**234**	**276**
Total Incremental Solar Capacity (a+b+c+d)		14	13	15	24	27	30	34	38	42
(e) Competitively Bid Ground-Mounted						*16*	*17*	*20*	*23*	*26*
(f) Rooftop						*3*	*3*	*3*	*3*	*4*
(g) Open Access Ground-Mounted						*6*	*6*	*6*	*7*	*7*
(h) Solar Pumps						*3*	*4*	*5*	*5*	*5*
Manufacturing Capacities										
Module	12	21	38	53	74	115	145	160	165	180
Cell	3	3	7	9	25	45	70	85	85	90
Wafer	-	-	-	-	2	8	15	25	35	40
Polysilicon	-	-	-	-	-	-	5	10	15	20

Source: CEA, Company, MOFSL

Exhibit 28: India Module and Cell Manufacturing Capacity (GW) (FY24-28E)



Source: MNRE. Company, MOFSL

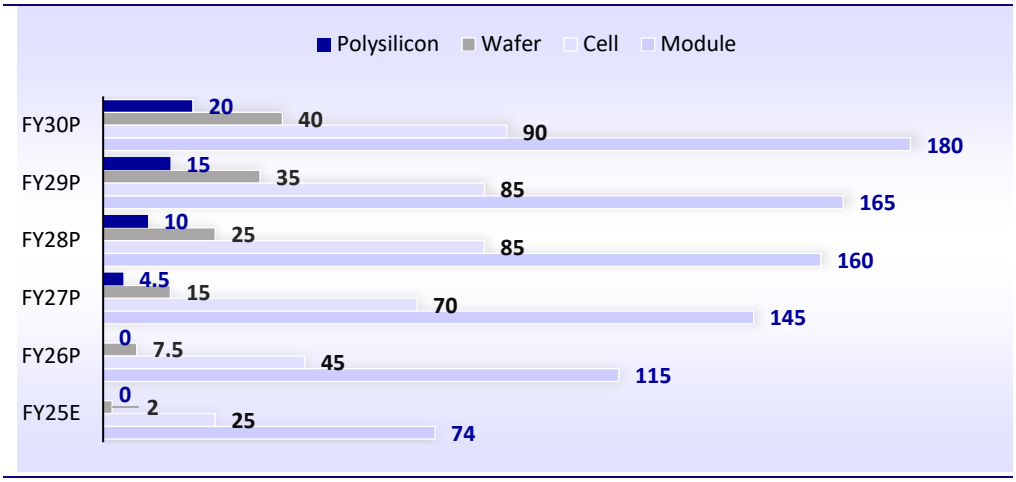
- **India's module and cell production surges in FY25:** India is witnessing rapid growth in its solar manufacturing ecosystem, with module production capacity rising strongly from 53GW in Mar'24 to 74GW by Mar'25. During the same period, solar PV cell capacity tripled from 9GW to 25GW. FY25 also marked a significant milestone with the commissioning of the country's first ingot-wafer manufacturing facility of 2GW capacity, taking initial steps toward a more integrated supply chain.
- **India positioned to emerge as key global solar export hub:** India's solar manufacturing ecosystem is poised for substantial growth. According to Emmvee, India's solar module capacity is expected to scale up to 175-185 GW by FY30. This expansion will be supported by significant upstream investments, including 85-95 GW of cell capacity, 35-45 GW of wafer capacity, and 15-25 GW of polysilicon capacity. However, persistent reliance on imported polysilicon and wafers remains a critical bottleneck, limiting full self-reliance and undermining long-term competitiveness in the global solar value chain.
  - This robust build-out not only positions India to meet its rising domestic demand but also enhances its competitiveness in global export markets, particularly the US. With growing trade restrictions on Chinese imports and steep anti-dumping duties imposed on modules from Southeast Asia, Indian manufacturers are well-placed to capitalize on shifting global supply chains and support international decarbonization efforts.

Exhibit 29: Module and cell capacity of key industry peers (GW)

Company Name	Modules Existing	Module Additions Planned	Cumulative Module Capacity	Cells Existing	Cells Additions Planned	Cumulative Cell Capacity
Saatvik Geen Energy	4.8	4.0	8.8	0.0	4.8	4.8
Waaree Energies (Domestic)	16.1	6.4	22.5	5.4	10.0	15.4
Premier Energies	5.1	5.9	11.0	3.2	7.5	10.7
Goldi Solar	10.7	4.0	14.7	0.0	4.0	4.0
Emmvee Solar	7.8	8.5	16.3	2.9	6.0	8.9
Vikram Solar	4.5	13.0	17.5	0.0	12.0	12.0
ReNew Photovoltaics	6.4	0.0	6.4	2.5	4.0	6.5

Source: Company; MOFSL

Exhibit 30: India's solar module, cell, wafer and polysilicon manufacturing capacity

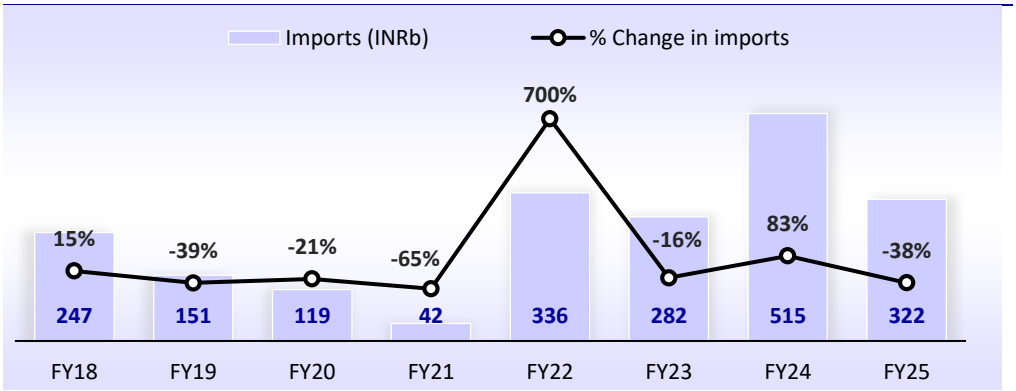


Source: Company, Crisil Intelligence, MOFSL

India's trade dynamics: From imports to oversupply in domestic markets

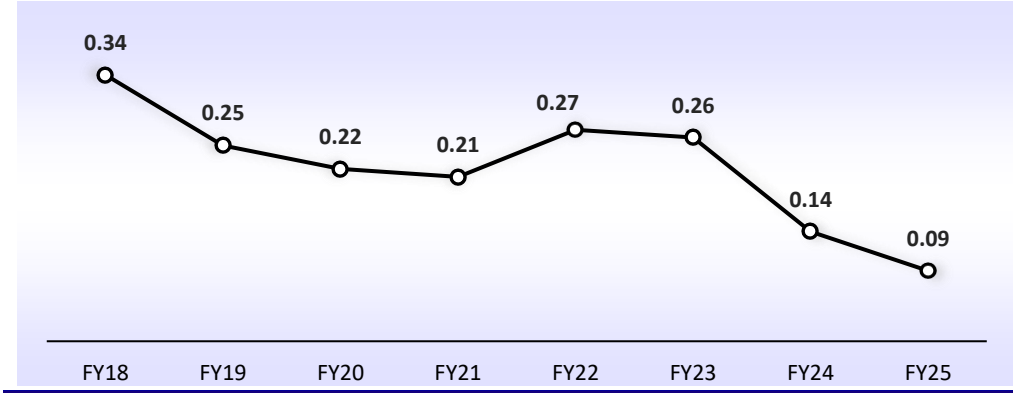
- **Shift from import dependence to domestic scale-up:** Between FY19 and FY25, more than 50% of India's solar module demand was met through imports due to limited local manufacturing, competitive foreign pricing, and developer preference for advanced technologies. However, with significant capacity additions, policy interventions like DCR (domestic content requirement) and ALMM, and rising domestic demand, import dependency is expected to decline sharply to just 0-5% by FY30.

Exhibit 31: Imports (INR b) and % change in imports



Source: Ministry of Commerce and Industry, CRISIL Intelligence, MOFSL

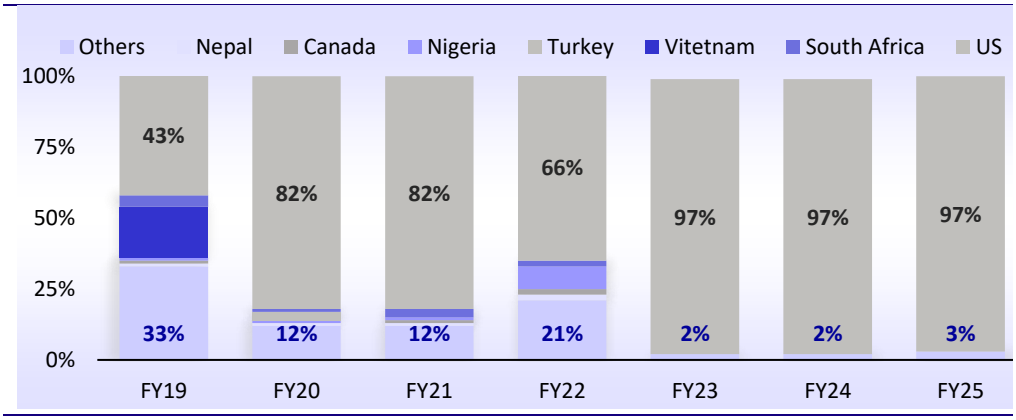
Exhibit 32: International module prices (USD/Wp)



Source: Ministry of Commerce and Industry, CRISIL Intelligence, MOFSL

- **Export boom driven by US market and geopolitics:** India's solar exports surged after FY22, rising 9x in FY23 and doubling in FY24, as US sanctions under the Uyghur Forced Labor Prevention Act (UFLPA) restricted imports from China-linked supply chains. The US accounted for 97% of India's solar exports from FY23 to FY25, positioning India as a key alternative supplier.

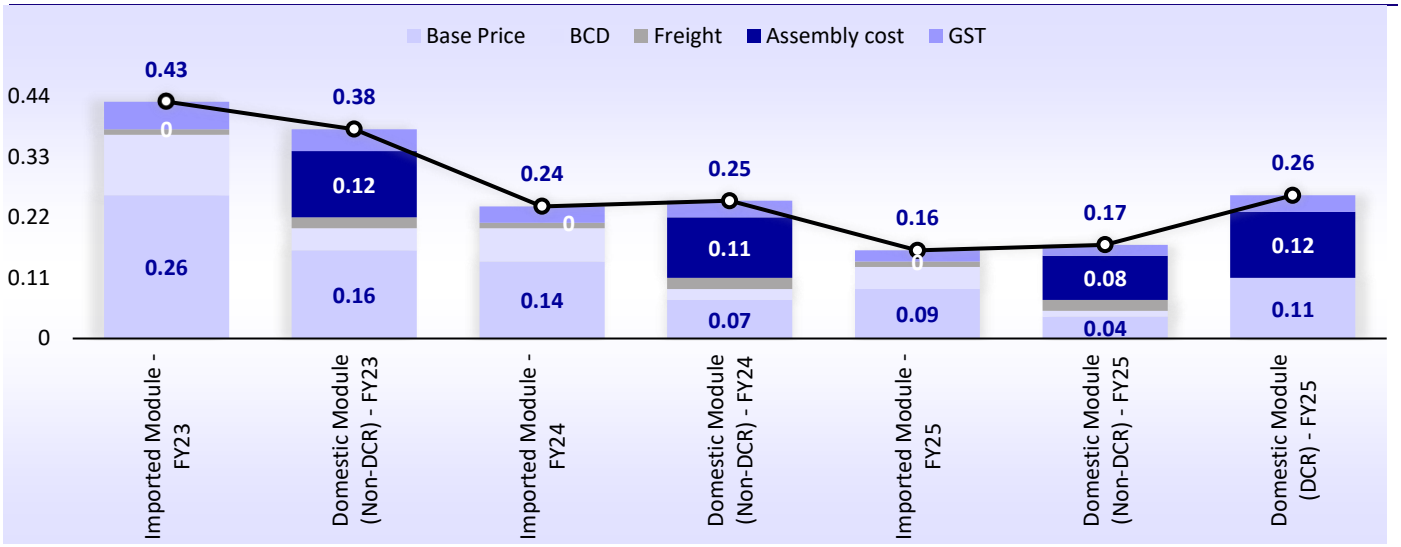
Exhibit 33: India's solar module exports: Country-wise breakup



Source: Company, MOFSL

- **Cost advantage over US, but pressure from Southeast Asia:** While Indian cell-based modules are ~USD0.08/Wp costlier than those made with imported cells, they remain 19-21% cheaper than US-made modules, supporting export viability. However, Southeast Asian countries like Vietnam and Malaysia remain strong competitors.

Exhibit 34: Cost comparison of imported vs. domestic modules (DCR and non-DCR) (USD/Wp)



Source: Company, MOFSL

Exhibit 35: Geography-wise cost of modules

US-Made Module (USD Cent/Wp)	Indian Cell-based Module (USD Cent/Wp)	Imported Cell-based Module (USD Cent/Wp)
32 to 33	25 to 27	15 to 17

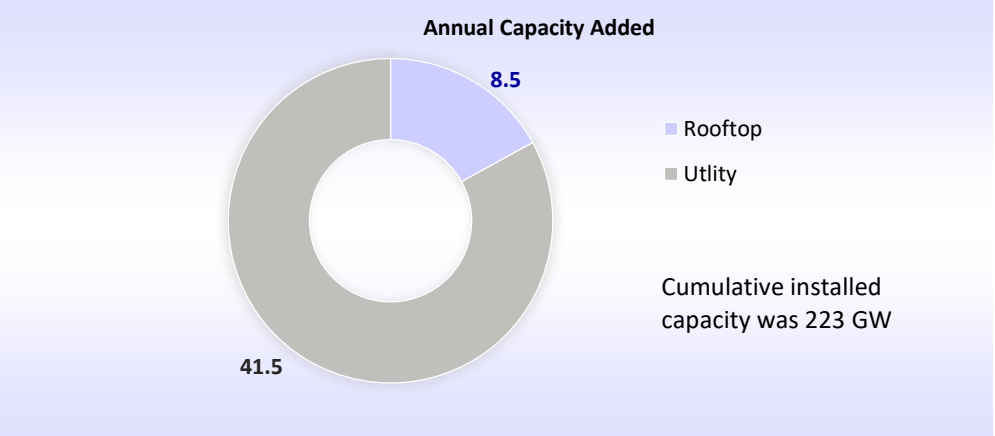
Source: CRISIL Intelligence, MOFSL

- **Dependence on imported raw materials remains a structural constraint:** Heavy reliance on imported polysilicon and wafers remains a key bottleneck for Indian manufacturers, limiting full self-reliance and long-term competitiveness in the global solar value chain.

US PV market outlook: Record growth meets rising policy and trade risks

- ***The US has emerged as a key growth driver for WEL, contributing ~20% to its total revenue in FY25. To strengthen its presence in this high-potential market, WEL commissioned a 1.6GW module manufacturing facility in FY25 and acquired a 1GW facility from Meyer Burger recently, taking the total capacity in the US to 2.6GW and plans to increase this capacity in the near term to 4.2GW. Given the US market's growing importance in WEL's revenue mix and expansion strategy, it forms the focal point of this analysis.***
- **Solar capacity crosses 248GW, fueled by IRA-driven momentum:** The US solar sector recorded a milestone year in 2024, adding 50GW of new capacity, a 54% YoY increase, driven by the full impact of incentives under the Inflation Reduction Act (IRA). Building on 48% growth in 2023, the US accounted for 8% of global solar additions, ranking second only to China. By 1QCY25, cumulative installed capacity crossed 248GW, underscoring the country's growing significance in the global energy transition.

Exhibit 36: Solar capacity added in US (GW) in CY24

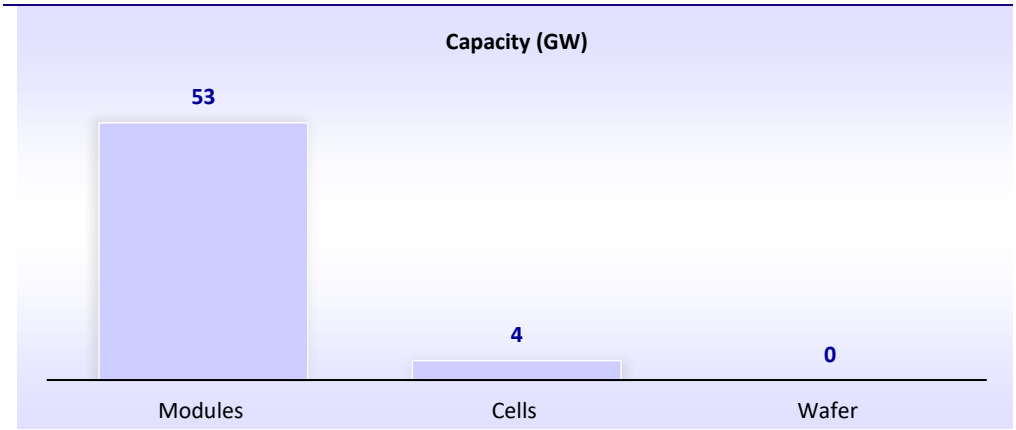


Source: Wood Mackenzie, MOFSL

Demand booms, manufacturing scales; but gaps persist

- **Aggressive solar installed capacity targets in US:** US solar demand is underpinned by the Energy Efficiency and Renewable Energy (EERE) program, which targeted 30GW of annual solar additions through 2025 and 60GW per year from 2025 to 2030. This translated into estimated module demand of 100–150GW between 2019 and 2024. Federal tax credits, renewable portfolio obligations (RPOs), loans, grants, and state-level incentives further supported growth during this period.
- **Domestic module manufacturing capacity has witnessed strong expansion:** In parallel, US module manufacturing has reached a key inflection point, with domestic module capacity exceeding 53GW as of May'25, a five-fold increase since the IRA's passage, theoretically sufficient to meet current national demand. However, upstream capacity remains underdeveloped, with cell production at just 4GW and no operational wafer facilities, leaving structural gaps in the supply chain and sustaining reliance on imports.

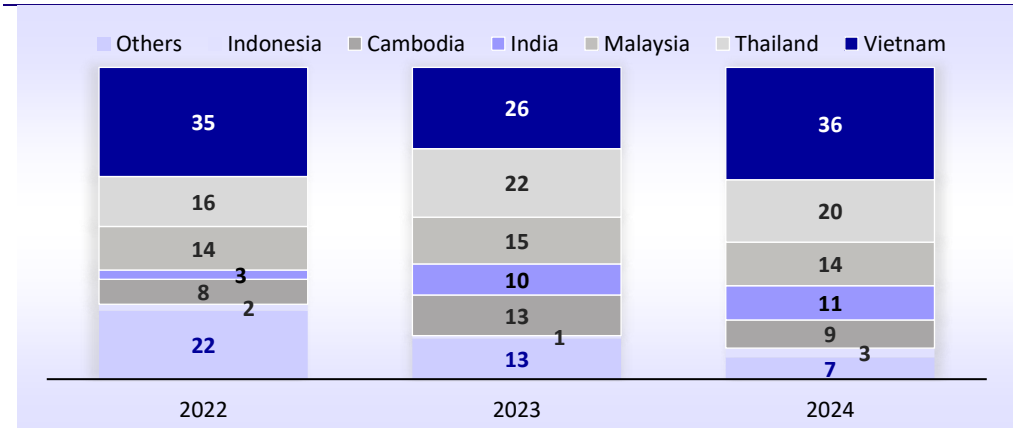
Exhibit 37: US manufacturing capacity as of May'25



Source: U.S. Department of Energy, MOFSL

- **Import dependence high amid limited domestic capacities:** The US continues to depend heavily on imports from ASEAN countries, with Vietnam leading at 36% of total solar imports in 2024, followed by Thailand (20%) and Malaysia (14%). India has also gained ground, increasing its share from 3% in 2022 to 11% in 2024.

Exhibit 38: ASEAN countries' share of solar component exports to US



Source: Trade Map, CRISIL Intelligence, MOFSL

- **IRA: Clean energy framework faces temporary funding pause:** The US IRA, signed into law in CY22, represents a landmark federal policy aimed at accelerating the clean energy transition. With a funding allocation of ~USD400b, the IRA was designed to strengthen domestic manufacturing, reduce emissions, and enhance energy security.
- A key feature of the IRA is the Section 45X Advanced Manufacturing Production Tax Credit (*link*), which offers direct incentives to manufacturers producing eligible clean energy components within the US and selling them to unrelated parties (individuals or organizations not under common control).

Exhibit 39: Applicable credit rates under Section 45X of IRA

Component	Credit Rate
Solar PV	
Solar Cells	❖ USD0.04/Wdc
Solar Modules	❖ USD0.07/Wdc
Wafers	❖ USD12/m²
Solar-grade Polysilicon	❖ USD3/kg
Polymeric Backsheets	❖ USD0.40/m²
Battery	
Electrode active materials	❖ 10% of the costs incurred by the taxpayer due to production of such materials
Battery cells	❖ USD35/kWh
Battery module	❖ USD10 (or, in the case of a battery module that does not use battery cells, USD45) per kWh

Source: US Department of Energy, MOFSL

- These incentives were structured to support end-to-end domestic supply chains, fostering both upstream and downstream investments.

- **Federal support weakens, clouding outlook for US solar:** Despite strong momentum, the market is entering a period of heightened uncertainty. In Jan'25, the administration issued an executive order suspending funding under both the IRA and the Infrastructure Investment and Jobs Act. Section 7 of the directive, titled *"Terminating the Green New Deal,"* mandates an immediate halt to fund disbursements. Concurrently, the newly passed legislation, the *"One Big Beautiful Bill Act"*, has recalibrated clean energy incentives, with significant implications for wind and solar developers (*link*).
- **Inside the 'One Big Beautiful Bill Act' (OBBBA):** The recently passed US energy legislation, marks a major shift in federal support for clean energy. While the IRA had strongly incentivized low-carbon technologies, the new bill scales back those benefits, especially for solar and wind.
- **OBBBA curtails tax rebates available under IRA:** Tax credits under Sections 45Y (*link*) (Production Tax Credit for clean electricity generation) and 48E (*link*) (Investment Tax Credit for technology-neutral net-zero electricity generation) are now restricted to projects that commence construction before 4th Jul'26 and are placed in service by the end of 2030, previously available through the early 2030s without such limits. The primary exception to the general rollback is the Section 45X advanced manufacturing PTC, which applies to non-wind components.
- These incentives are expected to face tighter eligibility rules under a forthcoming executive order, which is likely to redefine the criteria for what constitutes the "start of construction," potentially affecting project timelines and qualification for federal support.

- **Enforcement of Foreign Entity of Concern (FEOC) restrictions:**
- **Scope of application:** The OBBBA imposes FEOC limitations on all applicable IRA clean energy credits, excluding 45V, and introduces enhanced restrictions for 45Y PTC, 48 ITC, and 45X advanced manufacturing PTC with respect to facilities receiving "material assistance" from prohibited foreign entities.
- **Ownership and control provisions:** Tax credits shall not be claimed by, or with respect to, any prohibited foreign entity, defined to include specified foreign entities and foreign-influenced entities, encompassing entities subject to foreign government control, military affiliation, prohibited supply chains, or forced labor concerns.
- **Effective control criteria:** An entity shall be deemed foreign-influenced if a specified foreign entity possesses contractual, licensing, or other rights that

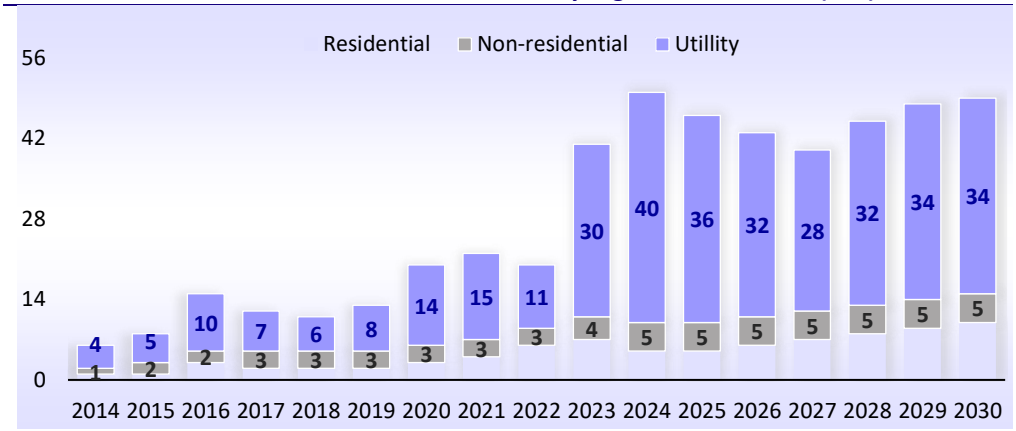
confer effective control over project operations, component production, or critical minerals, including per se control via long-term agreements exceeding statutory thresholds.

- **Material assistance restriction:** Eligibility for credits is denied where facilities or components receive material assistance from prohibited foreign entities, as determined by the statutory material assistance cost ratio; reliance on Treasury-issued safe harbors, supplier certifications, or pre-existing contracts is permitted where applicable.
- **Enforcement and penalties:** Statutory provisions extend the period for deficiency assessments to six years, reduce the threshold for substantial understatement penalties, impose penalties for false supplier certifications, and establish application to projects commencing construction after 2026, with specific sunset dates for ITC/PTC eligibility.

- **Trade policy challenges have further intensified headwinds:** Tariffs on key solar imports and final anti-dumping/countervailing duty (AD/CVD) rulings on Southeast Asian modules are disrupting supply chains and increasing project costs. These developments have led to a sharp drop in module imports, forcing a shift to more expensive and less reliable sourcing alternatives. A recent executive order prioritizing fossil fuel development also signals a potential pivot in federal energy policy, further clouding long-term outlooks for renewables.
- These factors are weighing heavily on the economics of utility-scale projects, increasing the risk of delays, cancellations, and reduced capital inflows. As federal support diminishes, state-level initiatives and corporate procurement are expected to play a larger role in driving demand.

- **Solar installations to average 43GW, dip before rebound:** Looking ahead, Wood Mackenzie forecasts a 2% annual decline in US solar installations between 2025 and 2030, with average annual additions of 43GWdc. All segments, including residential, commercial, community and utility scale, are expected to contract in 2025. The market is projected to shrink at an average rate of 7% annually through 2027 before rebounding between 2028 and 2030, supported by growth in domestic manufacturing and rising energy demand from AI data centers and reshoring activity.
- **Outlook remains risk-prone:** While the US cumulative capacity is expected to be over 250GWdc by 2030, the trajectory remains highly sensitive to evolving policy, trade, labor, and grid-related risks.

Exhibit 40: US solar PV installations and forecasts by segment, 2014-2030 (GW)



Source: Wood Mackenzie, MOFSL

India's govt policy is a catalyst for growth in solar installations and capacity

- **Shift in EBITDA mix amid WEL's US ramp-up and expansion:** Domestic (India) module business contributed more than 90% to WEL's consolidated EBITDA in FY25. However, by FY27, we estimate this share to decrease to ~67% of consolidated EBITDA as its US manufacturing capacity is ramped up to 4.2GW and newer segments like electrolyser, EPC and O&M ramp up operations.
- **PLI scheme:** The Ministry of New and Renewable Energy launched the PLI scheme for high-efficiency solar modules in Apr'21, initially allocating INR45b to support 8.7GW of capacity across three manufacturers. Given the strong response, the scheme's outlay was significantly expanded, and a second tranche was introduced in Sep'22 with an allocation of INR195b to support 36GW of capacity. By Oct'24, total investments under the scheme had reached ~INR350b, aimed at establishing vertically integrated solar manufacturing facilities. The scheme remains critical to the upstream solar value chain, particularly in polysilicon and wafer production, which are projected to account for over 80% of their capacity additions through the strengthening of this program by FY30, thereby reducing reliance on imports.

Exhibit 41: Solar PLI results of Tranche I and II

Players	Polysilicon (GW)	Wafer (GW)	Cells (GW)	Modules (GW)
Shirdi Sai Electricals Ltd	4	4	4	4
Reliance New Solar Energy Ltd	4	4	4	4
Adani Infrastructure Pvt Ltd	0.7	0.7	0.7	0.7
Total PLI Tranche I	**8.7**	**0.7**	**8.7**	**8.7**
Indosol Solar Pvt Ltd	6	6	6	6
Reliance New Energy Solar Ltd	6	6	6	6
FS India Solar Ventures Pvt Ltd	3.4	3.4	3.4	3.4
Waaree Energies Ltd	0	6	6	6
Avaada Ventures Pvt Ltd	0	3	3	3
ReNew Solar (Shakti Four) Pvt Ltd	0	4.8	4.8	4.8
JSW Renewable Technologies Ltd	0	1	1	1
Grew Energy Pvt Ltd	0	2	2	2
Vikram Solar Ltd	0	0	2.4	2.4
AMPIN Solar One Pvt Ltd	0	0	1	1
TP Solar Ltd	0	0	4	4
Total PLI Tranche II	**15.4**	**32.2**	**39.6**	**39.6**
Total PLI Tranche I+II	**24.1**	**32.9**	**48.3**	**48.3**

Source: MNRE, MOFSL

- **Approved List of Models and Manufacturers (ALMM):** The ALMM, introduced in 2019, serves to uphold the quality and performance standards of solar modules used in India. Only modules listed under ALMM are permitted in government-supported solar installations. The scheme sets minimum efficiency thresholds at 20% for utility-scale projects, 19.5% for rooftop and solar pumping systems, and 19% for solar lighting.
- **Approved List of Cell Manufacturers (ALCM):** The MNRE has issued a clarification regarding ALMM-II, which pertains to solar modules using domestically manufactured cells. As per the earlier notification, projects with bids issued on or after 9th Dec'24 were mandated to source modules listed under ALMM-I, incorporating domestically manufactured cells. Through the recent clarification, MNRE has allowed grandfathering of projects to mitigate the demand-supply imbalance. Accordingly, projects will be exempt from the

ALMM-II requirement until the end of one month from the date of publication of the ALMM-II list. Consequently, even projects commissioned after 1st Jun'26 may continue to use non-ALMM-II cells, provided they fall under the grandfathering exemption.

- **MNRE proposes third ALMM for solar wafers, effective Jun'28:** The MNRE has proposed a third ALMM for solar wafers, to take effect from Jun'28, with comments due by 11th Oct'25. Currently, ALMM covers modules (List-I) and cells (List-II), the latter effective Jun'26. The wafer list will be issued only if it includes at least three independent manufacturers (no common ownership) with a combined capacity of ≥15 GW per year and matching ingot capacity, with listed wafer capacity reflecting both ingots and wafers. Under the proposal, all ALMM-covered projects must source modules from List-I, which must use cells from List-II and, once implemented, wafers from List-III; exemptions for cells will automatically extend to wafers. Additionally, projects bid out before one month after the first wafer list's issuance will remain exempt from using ALMM-listed wafers, even if commissioned after 1st Jun'28. We believe ALMM for wafers raises entry barriers significantly as capex for setting up integrated module capacity rises from INR1.5b/GW to INR11-12b/GW. This means that in order to set up competitive cost economics for a 5 GW integrated module plant, the capex requirement has risen from ~INR8b to ~INR60b.

- **Domestic content requirement (DCR):** India's DCR mandates the use of locally manufactured solar cells and modules in select government-supported projects such as CPSU Phase-II, PM-KUSUM, and certain rooftop programs. Aimed at boosting domestic manufacturing and reducing import dependence, the DCR applies only to government procurement-linked projects to remain compliant with WTO rules. While it does not cover private or commercial solar projects, it plays a key role in supporting India's push for an integrated solar manufacturing ecosystem, particularly in conjunction with initiatives like the PLI scheme.
- **Solar parks and ultra-mega renewable energy power parks (UMREPPs):** The GoI launched an ambitious solar park development program in CY14, initially targeting land banks for 20GW of solar capacity across 25 states. This target was expanded to 40GW in Mar'17, with the goal of establishing at least 50 solar parks by FY22. As of Dec'24, a total of 57 solar parks and UMREPPs with a cumulative capacity of ~41GW have been proposed across 13 states. Of this, ~12GW has been commissioned, ~13GW is under construction, and ~15GW is at various stages of award or tendering.
- **Basic custom duties (BCD):** To support domestic manufacturing, the Ministry of Power imposed BCD on modules and cells, effective Apr'22. While this has increased the capital costs, it narrowed the price gap with imports, driving demand for Indian-made modules. The FY26 Union Budget further streamlined the duty structure, reinforcing long-term policy clarity for domestic solar manufacturers.

Exhibit 42: India's new vs. old duty structure

Solar Module	Old duty structure	New duty structure
BCD	40%	20%
SWS	4%	0%
AIDC	0%	20%
Solar Cell		
BCD	25%	20%
SWS	3%	0%
AIDC		7.5%

Source: Emmvee Photovoltaics, MOFSL

- **Renewable purchase obligations (RPO):** RPOs are regulatory mandates that require DISCOMs, captive power producers, and open access consumers to source a fixed percentage of their electricity from renewable sources. With a target of 43.33% by CY30, RPOs are a key policy tool to drive renewable energy capacity additions across India. While there is no mandate on specific technologies, stricter enforcement, especially for C&I consumers, is creating strong demand visibility and unlocking growth opportunities, particularly in underserved regions.
- **PM Surya Ghar Muft Bijli Yojana:** It is a rooftop solar scheme launched in 2024 to provide free electricity (up to 300 units/month) to 10m households, backed by subsidies of up to INR78,000 and low-interest loans for systems up to 3kW. With a total outlay of INR750b, the scheme will be implemented through FY26-27. The scheme significantly boosts the domestic solar industry by driving large-scale demand, supporting local manufacturing, and accelerating rooftop adoption, paving the way for a more decentralized and resilient solar ecosystem.
- **PM-KUSUM Scheme**: The scheme aims to add 34.8GW of solar capacity by Mar'26 to reduce diesel use in agriculture, ensure energy and water security for farmers, and boost rural incomes. It includes: **Component-A**, which enables farmers and groups to set up 10GW of decentralized solar plants on unused or cultivable land; **Component-B**, targeting the installation of 1.75m standalone solar pumps in off-grid areas; and **Component-C**, which seeks to solarize 1m grid-connected pumps, allowing farmers to use solar power for irrigation and sell surplus power to DISCOMs for extra income.
- **Central Public Sector Undertaking (CPSU) scheme**: The CPSU scheme, launched in 2015, was designed to support the development of 1GW of grid-connected solar PV projects using domestically manufactured cells and modules, implemented by CPSUs with viability gap funding (VGF). In 2019, it was significantly scaled up to 12GW to accelerate domestic manufacturing. Under Phase II, SECI issued tenders for 2GW and 1.5GW; however, both rounds were undersubscribed, resulting in allocations of just 922MW and ~1,104MW, of which 867MW and 789MW have been commissioned. In contrast, CPSU Tranche III, tendered by IREDA for 5GW, saw full subscription, with the entire capacity awarded and currently under construction.

Peer comparison

Exhibit 43: Comparative summary of domestic module manufacturers

Parameter	Waaree Energies	Goldi Solar	Vikram Solar	Premier Energies	Rayzon Solar	Saatvik Green	Websol Energy	Emmvee Photovoltaic
Total module capacity (GW)	16.1*	10.7	4.5	5.1	6	4.8	0.6	7.8
Module pipeline (GW)	6.4*	4	13.5	5.9	2	4	0	0
Total cell capacity (GW)	5.4	0	0	3.2	0	0	0.6	2.9
Cell pipeline (GW)	10	4	12	7.5	3.5	4.8	0.6	0
Ingot/wafer pipeline (GW)	10	-	-	10	-	-	-	-
Year of incorporation	1990	2011	2005	1995	2017	2015	1990	2007
TOPCon modules mfg	Yes	Yes	–	Yes	Yes	Yes	No	Yes
Closing order book FY25 (INRb)	470	69	NA	84	13	46	NA	NA
Export-oriented	✔	✔	✔	✔	✔	✔	NA	✔
ALMM Capacity (May'25 - GW)	11.9	8.9	2.8	3.6	3.0	1.7	0.2	4.4

**Includes only India capacity*

Source: Emmvee, MOFSL

Exhibit 44: Financial comparative analysis of manufacturers in India

Particulars	Waaree Energies		Premier Energies		Emmvee Photovoltaic Power	
	FY25	FY24	FY25	FY24	FY25	FY24
Revenue (₹ bn)	144	114	65	31	23	10
EBITDA (₹ bn)	31	18	19	5	7	1
EBITDA Margin (%)	21	15	29	16	31	13
PAT (₹ bn)	19	13	9	2	4	0.3
PAT Margin (%)	13	11	14	7	15	5
Debt to Equity (x)	NA	0.1	0.7	2.2	3.6	8.5
ROCE (%)	NA	26	NA	26	23	5
ROE (%)	NA	30	NA	44	105	19

Source: Emmvee, MOFSL

Exhibit 45: Financial comparative analysis of manufacturers in India

Particulars	Saatvik Green Energy		Rayzon Solar		Goldi Solar	
	FY24	FY23	FY24	FY23	FY24	FY23
Revenue (₹ bn)	11	6	13	7	7	6
EBITDA (₹ million)	1,576	258	1,013	449	320	233
EBITDA Margin (%)	15	5	8	7	4	4
PAT (₹ bn)	1,005	47	609	255	206	121
PAT Margin (%)	9	0.7	5	4	3	2.0
Debt to Equity (x)	2.2	7.1	1.2	2.1	1.1	1.2
ROCE (%)	55%	13%	66%	57%	24%	21%
ROE (%)	143%	21%	107%	125%	27%	20%

Source: Emmvee, MOFSL

Exhibit 46: Global peer comparison

Parameter	LONGi Solar	Trina Solar	Jinko Solar	JA Solar	Canadian Solar
Experience in years	24	27	18	19	23
Operational capacity GW (Module, Cell & Wafer)	120/80/170	95/75/55	120/95/130	95/86/86	60/48/31
Key products/services	❖ modules, wafers, rooftop	❖ modules, solar trackers, EPC	❖ modules, energy storage systems	❖ modules, energy storage systems	❖ modules, energy storage systems,
Key technologies offered	❖ TOPCon, Mono PERC	❖ Bi- PERC, TOPCon, HJT	❖ bi- PERC, TOPCon	❖ TOPCon, Mono PERC,	❖ TOPCon Mono PERC, HJT

Source: Emmvee, MOFSL

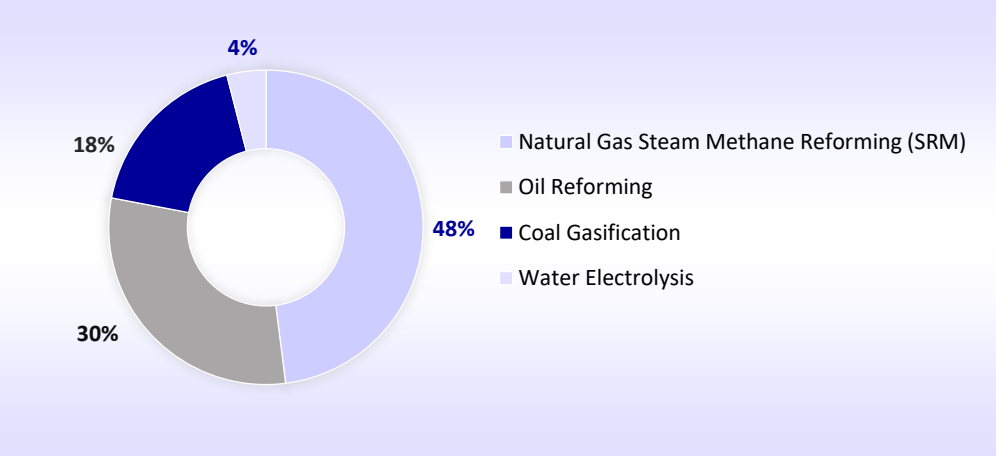
Paving the way for green hydrogen

- ***300 MWp electrolyser facility to begin contribution from FY28: WEL has secured a PLI for a 300 MWp electrolyser manufacturing facility under construction in Valsad, Gujarat, along with another PLI under the SIGHT scheme to produce 90,000 tons of green hydrogen. The company is investing INR5.5b in the electrolyser facility (expected to be operational by FY27), and we estimate it to contribute to revenue from FY28 onward. Looking ahead, WEL plans to integrate hydrogen and solar solutions for industrial and utility-scale applications. Recently, WEL announced an enhancement of 300MWp facility to 1000MWp, with an additional investment of ~INR1.25b.***
- **Clean energy; high impact:** Hydrogen has a high specific energy of 120-140 MJ/kg, making it 3-4 times more energy-dense than diesel or gasoline and 30-90 times higher than batteries. Unlike conventional fuels, which emit 75-85 g of CO_2 per MJ along with other pollutants, hydrogen's only by-product is water. While hydrogen is not a new energy carrier, green hydrogen is gaining prominence for its role in decarbonization. Its environmental impact, however, depends on the production method, giving rise to a "color spectrum" classification that reflects varying carbon intensities across different hydrogen types.
- **Types of hydrogen - Color Spectrum:**
- **Green hydrogen:** Green hydrogen is produced by using renewable electricity, typically from surplus solar or wind power to electrolyze water. Through this process, electrolysers split water into hydrogen and oxygen via an electrochemical reaction, generating hydrogen without any carbon emissions. At present, green hydrogen accounts for only a small share of total hydrogen production, primarily due to its high cost. However, similar to the cost trajectory of wind and solar power, green hydrogen is expected to become more competitive as technology scales and adoption increases.
- **Blue hydrogen:** Blue hydrogen is produced from natural gas through steam reforming, which generates hydrogen alongside carbon dioxide. To lower emissions, the process incorporates carbon capture and storage (CCS) to trap and store the CO_2. While often labeled "low-carbon hydrogen," it does not fully eliminate greenhouse gas emissions.
- **Grey hydrogen:** Currently the most widespread form of hydrogen production, grey hydrogen is derived from natural gas or methane through steam methane reforming. Unlike blue hydrogen, this process does not incorporate CCS, meaning the carbon dioxide generated is released directly into the atmosphere.
- **Black and brown hydrogen:** Produced from black coal or lignite (brown coal), these forms of hydrogen sit at the opposite end of the spectrum from green hydrogen and are considered the most environmentally harmful due to their high carbon emissions.
- **Pink hydrogen:** Pink hydrogen is produced through electrolysis powered by nuclear energy. In some contexts, nuclear-derived hydrogen is also labeled as purple or red hydrogen.
- **Turquoise hydrogen:** A relatively new category in the hydrogen spectrum, turquoise hydrogen is produced through methane pyrolysis, which yields hydrogen and solid carbon instead of carbon dioxide. While still unproven at

scale, it is considered a potential low-emission option, provided the process is powered by renewable energy and the resulting solid carbon is permanently stored or effectively utilized.

- **Yellow hydrogen:** Yellow hydrogen refers to hydrogen produced via electrolysis powered specifically by solar energy.
- **White hydrogen:** White hydrogen is naturally occurring, found in underground geological deposits and sometimes released during fracking. Currently, there are no commercial strategies to extract or utilize this form of hydrogen.

Exhibit 47: Global hydrogen production by process



Source: EY, MOFSL

Exhibit 48: Types of hydrogen

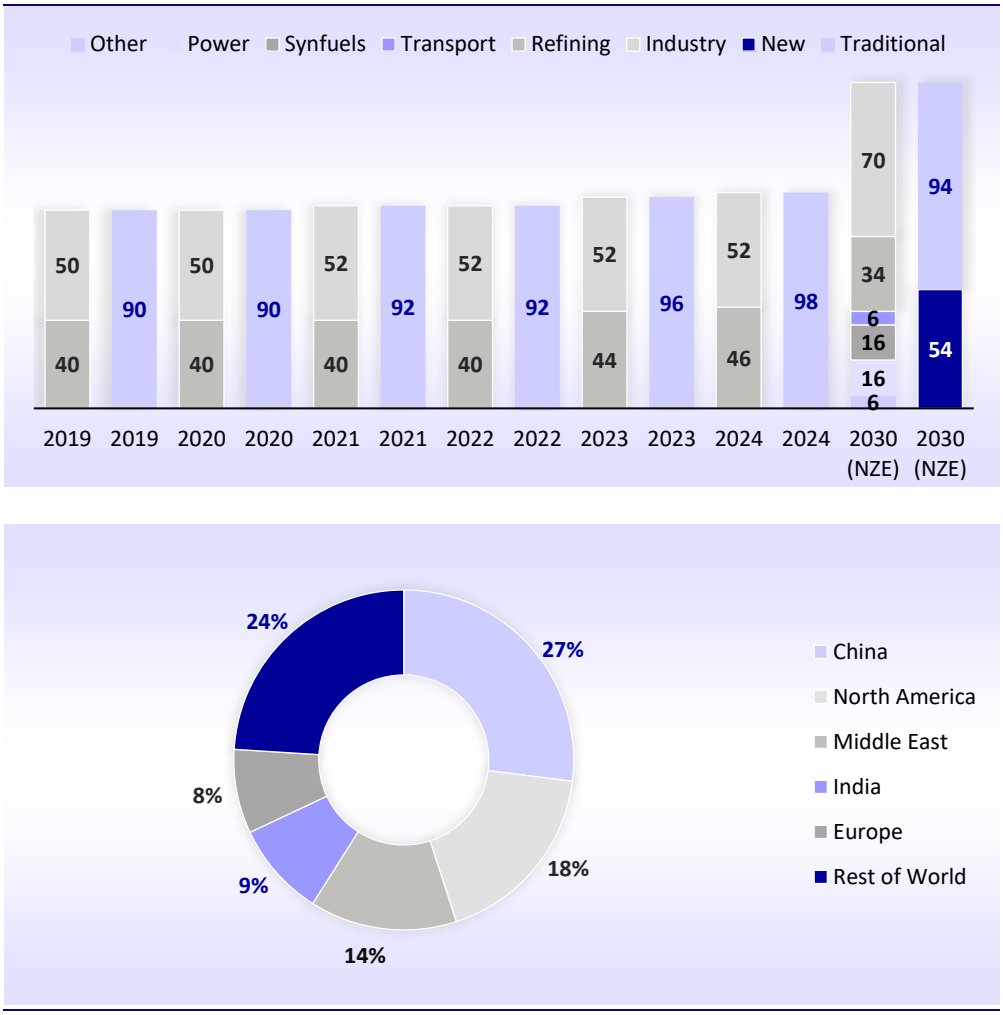
Color					
Type	Black/Brown Hydrogen	Grey Hydrogen	Turquoise Hydrogen	Pink Hydrogen	Green Hydrogen
Process	Coal Gasification	Methane Reformation	Pyrolisys	Electrolysis	Electrolysis
Source	Coal	Natural Gas	Methane	Nuclear Energy	Renewable Energy

Source: EY, MOFSL

Global hydrogen: Innovation rising, demand still conventional

- **Innovation stepping up but conventional sectors key demand drivers:** Global hydrogen demand reached 97Mt in 2023 and is projected to approach 100Mt in 2024. This increase is primarily driven by traditional demand from sectors such as oil refining and chemicals, with only limited contributions from new applications crucial for clean energy transitions. Sectors like heavy industry, long-distance transport, and energy storage seen as essential for deep decarbonization make up less than 1% of total global hydrogen demand, despite their segment growing by 40% year-over-year. This highlights that while innovation is rising, the bulk of demand remains concentrated in mature sectors.

Exhibit 49: Hydrogen demand by sector (Mtpa) and by region



Source: IEA, MOFSL

NZE: Net Zero Emissions by 2050 Scenario

- **Low emission hydrogen demand to triple by 2030:** The pace of low-emissions hydrogen adoption is improving but remains a small subset: demand grew by 10% in 2023, but still totaled less than 1MT. Policy measures – mandates, incentives, and market tools – are ramping up worldwide. If these efforts accelerate, global low-emission hydrogen demand could exceed 6mtpa by 2030, though this is only 10% of what climate bodies estimate is needed for Net Zero by 2050. Notably, several large-scale projects, especially in refining, chemicals, and steel, secured final investment decisions in 2023, which will likely push low-emissions hydrogen demand to around 1.5mtpa by 2030, almost triple current levels.
- As per IEA, green hydrogen, produced via water electrolysis powered by renewables (wind and solar), represents the fastest-growing subsector. The global green hydrogen market was valued at USD8b in 2024. By 2030, this market is projected to reach USD61b, achieving a strong CAGR of 39% from 2025 to 2030.
- Investment and technological progress in electrolysers and renewable energy are reducing costs, but global market penetration is still in early stages relative to fossil-derived hydrogen.

Exhibit 50: Electrolyser technology

Parameter	Alkaline	Proton Exchange Membrane (PEM)
Definition	❖ Uses thick membranes with nickel-based electrodes.	❖ Utilizes thin perfluorosulfonic acid (PFSA) membranes.
Operating Pressure	❖ Moderate (30 bar)	❖ High (70 bar)
Life	❖ Has a life of 60,000 hours	❖ Has a life of 80,000 hours
Efficiency	❖ Moderately efficient at approximately 75% efficiency	❖ Highly efficient at approximately 85% efficiency
Capex	❖ CAPEX requirement is USD 750-1,000kW	❖ CAPEX requirement is USD 600-1,250/kW

Source: IEA, IRENA, Industry, MOFSL

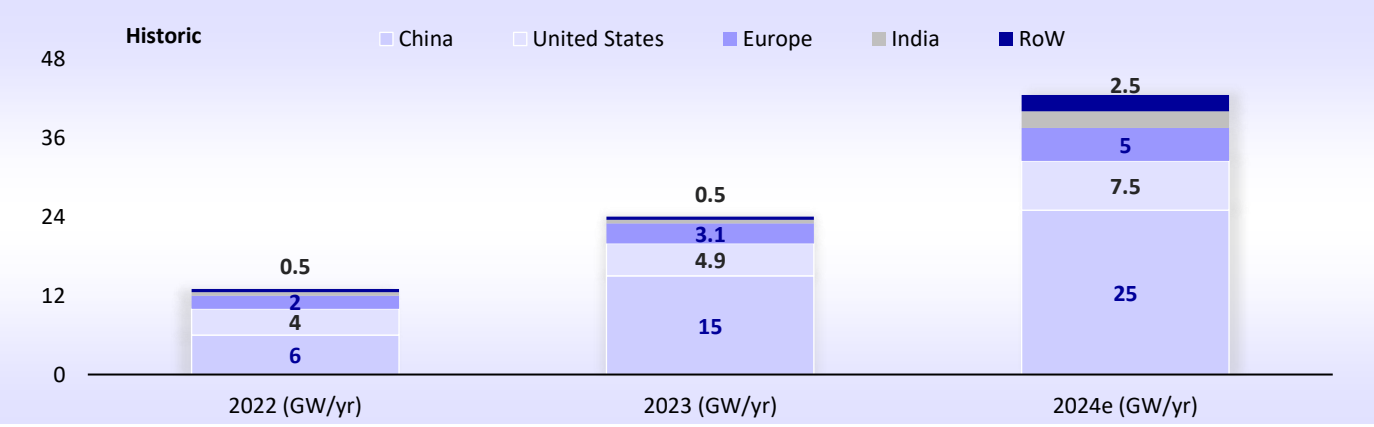
Global electrolyser capacity: Rapid growth led by China

- Global **installed water electrolyser capacity reached 1.4GW at the end of 2023**, nearly doubling vs. 2022. As per IEA, by the end of 2024, capacity could rise to around 5GW if all announced projects come online.
  - China dominates the sector, accounting for 80% of new 2023 capacity and almost 70% by the end of 2024.
  - As per IEA, announced projects suggest global installed capacity could rise from 1.4GW in 2023 to around 230GW by 2030, and potentially up to 520GW if early-stage developments materialize.

Manufacturing capacity doubling, China leads future growth

- Global manufacturing capacity for electrolyser assembly reached 25GW per year by the end of 2023, nearly double the level in 2022, based on facility sizes announced by companies.
- Almost three-quarters of the new additions were in China, which accounted for 60% of global capacity and is expected to maintain this dominant share in the near term.
- By 2030, announced projects could lift global electrolyser manufacturing capacity to over 165GW per year. Of this, about 30% has already reached FID, while another 30% has been announced without a clear start date. If only projects expected to be operational by 2030 are considered, total capacity could reach 116GW per year, sufficient to meet almost two-thirds of the requirements under the NZE scenario.

Exhibit 51: Historic (2022-2024e) and announced (2030) electrolyser manufacturing capacity

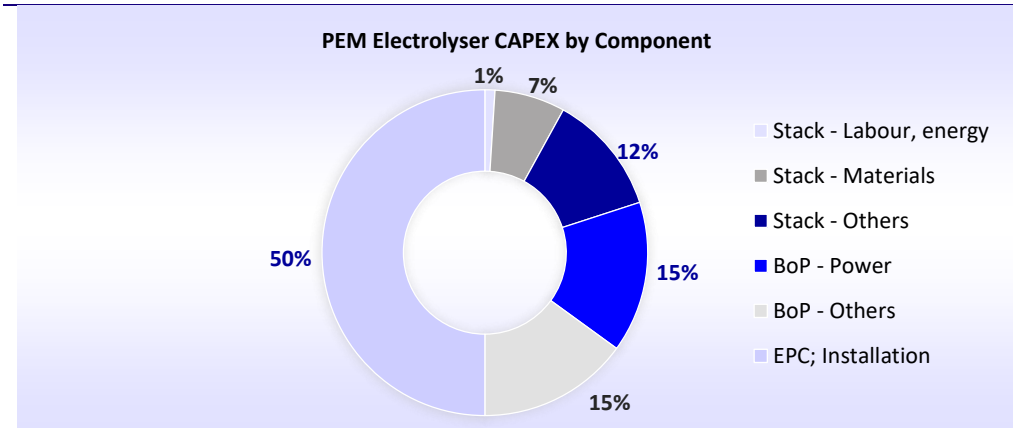


Source: IEA, MOFSL

Electrolyser costs: Rising now, but significant declines expected by 2030

- The installed cost of water electrolysers has risen in recent years, mainly due to inflation in materials and labor, as well as higher interest rates. In 2023, capex for complete electrolyser systems, including equipment, gas treatment, balance-of-plant, engineering, procurement, construction, and contingencies, ranged from USD2,000/kW for alkaline models to USD2,450/kW for PEM (Proton Exchange Membrane) variants. Notably, alkaline electrolysers manufactured in China are significantly less expensive than their European or North American counterparts, with capex as low as USD750–USD1,300/kW for a fully installed system.
- The total installed cost of an electrolyser system is comprised of three main components: the stack, the balance of plant (including items like rectifiers, tanks, pumps, piping, cooling, valves, and instrumentation), and installation costs. The stack itself accounts for 50-60% of the uninstalled system cost, while installation can make up as much as half of the final installed price.
- Looking forward, planned increases in production capacity and the advancement of mass manufacturing techniques, especially for the stack, are expected to drive costs down by 40-50% by the end of the decade, and possibly up to 55% for early-stage projects. These anticipated reductions nearly match those modeled for the net zero emission (NZE) scenario, which projects a 55-60% decrease in capital costs by 2030, provided 560GW of installed capacity is achieved. Under more conservative forecasts (STEPS), which focus on projects that have already reached final investment decision, the cost decline is somewhat smaller, at around 40% by 2030.

Exhibit 52: PEM electrolyser capex by component



Source: IEA, MOFSL

India's role in the global green hydrogen landscape

- Green hydrogen is emerging as a cornerstone of India's clean energy transition, with the potential to decarbonize hard-to-abate sectors such as mobility, steel, refining, petrochemicals, and fertilizers, while advancing energy independence. Backed by ambitious government targets, favorable renewable resources, and strong policy support, India is rapidly positioning itself as a leading player in the global green hydrogen market. By 2030, production capacity is expected to reach **5mmtpa**, reducing dependence on fossil fuel imports and cutting cumulative import costs by nearly **INR1t.**
- **National Green Hydrogen Mission of India (NGHM)**
  - The NGHM, approved by the Union Cabinet on 4th Jan'23, provides a comprehensive roadmap to build a green hydrogen ecosystem and address sectoral opportunities and challenges, in line with global hydrogen strategies announced by major economies.
  - The Mission has an initial budget of INR197b, including INR175b for the Strategic Interventions for Green Hydrogen Transition (SIGHT) program, INR15b for pilot projects (low-carbon steel, mobility, shipping, and hub development), INR4b for R&D, and INR4b for other components.
  - The Ministry of New and Renewable Energy has issued scheme guidelines for implementing the various components of the Mission, which is expected to deliver the following outcomes by **2030**:
    - Establishment of at least **5mmtpa** of green hydrogen production capacity.
    - Mobilization of over **INR8t** in total investments.
    - Creation of more than **600,000 jobs**.
    - Reduction in fossil fuel imports worth over **INR1t**.
    - Abatement of nearly 50mmt of annual greenhouse gas emissions.
  - The Mission will roll out in two phases:
    - **Phase I (2022–26):** Build demand and supply by scaling domestic electrolyser manufacturing, deploying in refineries, fertilizers, and city gas, and running pilots in steel, heavy transport, and shipping. Establish R&D, regulatory, and standards framework.
    - **Phase II (2026–30):** With costs turning competitive, expand into refineries and fertilizers at scale, explore commercial projects in steel, mobility and shipping, and launch pilots in railways and aviation. Scale up R&D to drive economy-wide decarbonization.
  - **SIGHT program:** WEL is advancing its clean energy portfolio by developing a 300 MWp green hydrogen electrolyser plant in Valsad, Gujarat, supported by a PLI, and producing 90,000 tons of green hydrogen under the SIGHT scheme. The company is investing INR5.5b in the electrolyser facility, which it expects to be operational by FY27, and we expect it to contribute to revenue from FY28 onward.

ESS: The strategic move for the future

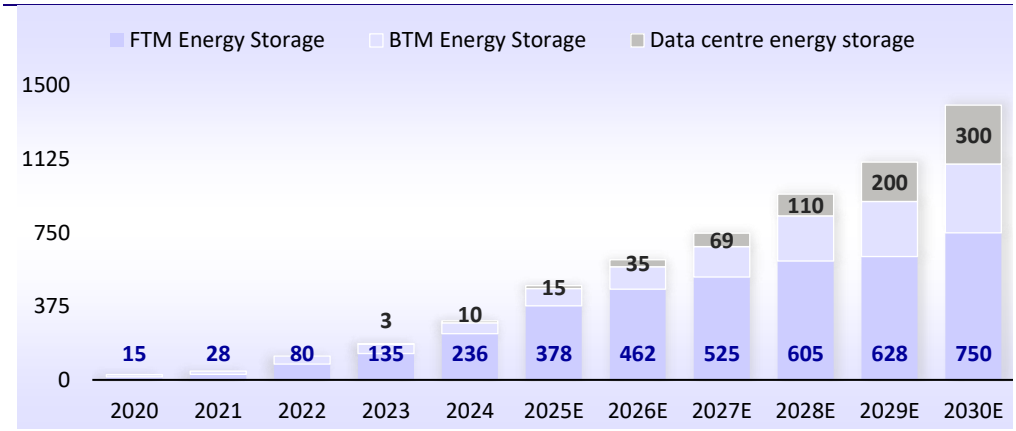
- ***WEL's 3.5 GWh battery storage investment of INR20.7b: WEL is making strategic investments across the energy transition value chain to strengthen its position in battery storage and energy independence. It is setting up a 3.5 GWh lithium-ion battery cell manufacturing facility to support storage-integrated EPC and hybrid projects. It has secured a 40 MWh BESS LoI from Continuum Green. The overall capex for the large-scale battery storage facility in Gujarat amounts to INR20.7b, with operations expected to commence by FY27.***
- ***Recently, WEL announced an enhancement of this project's capacity from 3.5 GWh to 20 GWh, with an additional investment of ~INR80b in its wholly owned subsidiary, Waaree Energy Storage Solutions Pvt. Ltd.***
- Energy Storage Systems (ESS), particularly those based on electrochemical technologies like LFP lithium-ion batteries, are critical for enhancing the flexibility, reliability, and efficiency of modern power systems. ESS enables the storage, conversion, and timely dispatch of electricity, supporting a wide range of applications across both front-of-the-meter (FTM – storage assets connected directly to the transmission or distribution grid) and behind-the-meter (BTM – storage assets located on the customer's side of the electricity meter) deployments.
- **FTM storage** (grid-level applications):
  - Enhances grid stability and ensures generation adequacy.
  - Improves renewable energy integration by mitigating the intermittency of wind and solar.
  - Enables peak shaving and valley filling through time-shifted energy dispatch.
  - Eases grid congestion by absorbing excess energy and releasing it during low-load conditions.
- **BTM storage** (user-side applications):
  - Provides stable and reliable power supply for industrial, commercial, and residential users.
  - Enables cost savings by optimizing usage based on time-of-use tariffs.
  - Reduces peak demand charges and defers the need for transformer upgrades.
  - Serves as backup power during outages or grid limitations.
- Advancements in ESS technologies are also driving the development of micro-grids and virtual power plants (VPPs), enabling decentralized energy management and enhancing overall grid resilience.
- With an increasing share of energy from renewable sources, primarily solar, the Ministry of New and Renewable Energy believes that energy storage systems help in reducing the variability of renewable energy generation, improving grid stability and enabling energy/peak shifting. As per the National Electricity Plan (NEP) 2023 of the Central Electricity Authority (CEA), the energy storage capacity requirement is projected to be 411 GWh (175 GWh from PSP and 236 GWh from BESS) in 2031-32.
- **Government initiatives:** To lower the cost of stored power, the government has introduced an INR91b viability gap funding (VGF) support for 43.2GWh of BESS capacity. Further, a PLI scheme has been announced to support the manufacturing of 50GWh advanced chemistry cell (ACC) batteries with a

budgeted outlay of INR181b. Further, the inter-state transmission system (ISTS) charges have been fully waived for BESS projects commissioned by Jun'28 and PSP projects for which construction was awarded by Jun'28.

Global ESS battery shipments set to reach 1,400 GWh by 2030

- **Global ESS battery demand accelerates with renewable growth:** The global installed capacity of wind and solar power continues to rise, underscoring the critical regulatory function of FTM energy storage. At the same time, the growing adoption of BTM energy storage particularly in industrial, commercial, and data center applications has significantly boosted demand for ESS batteries. As a result, global ESS battery shipments have surged from 27GWh in 2020 to 301GWh in 2024, reflecting a CAGR of 82.7%. Looking ahead, shipments are projected to reach 1,400GWh by 2030, with a CAGR of 29.2% from 2024 to 2030.

Exhibit 53: Global ESS shipments by application (GWh)



Source: GGII, MOFSL

- **FTM storage leads growth:** In 2024, FTM storage accounted for over 75% of global ESS battery shipments, growing from 15GWh in 2020 to 236GWh (CAGR: 99.2%). Shipments are expected to reach 750GWh by 2030, growing at 21.3% annually.
- **BTM storage and data center ESS demand set to soar:** BTM shipments rose from 12GWh in 2020 to 55GWh in 2024 (CAGR: 45.8%) and are projected to reach 350GWh by 2030 (CAGR: 36.2%). ESS demand from data centers is expected to surge from 10GWh in 2024 to 300GWh by 2030 at a 76.3% CAGR.

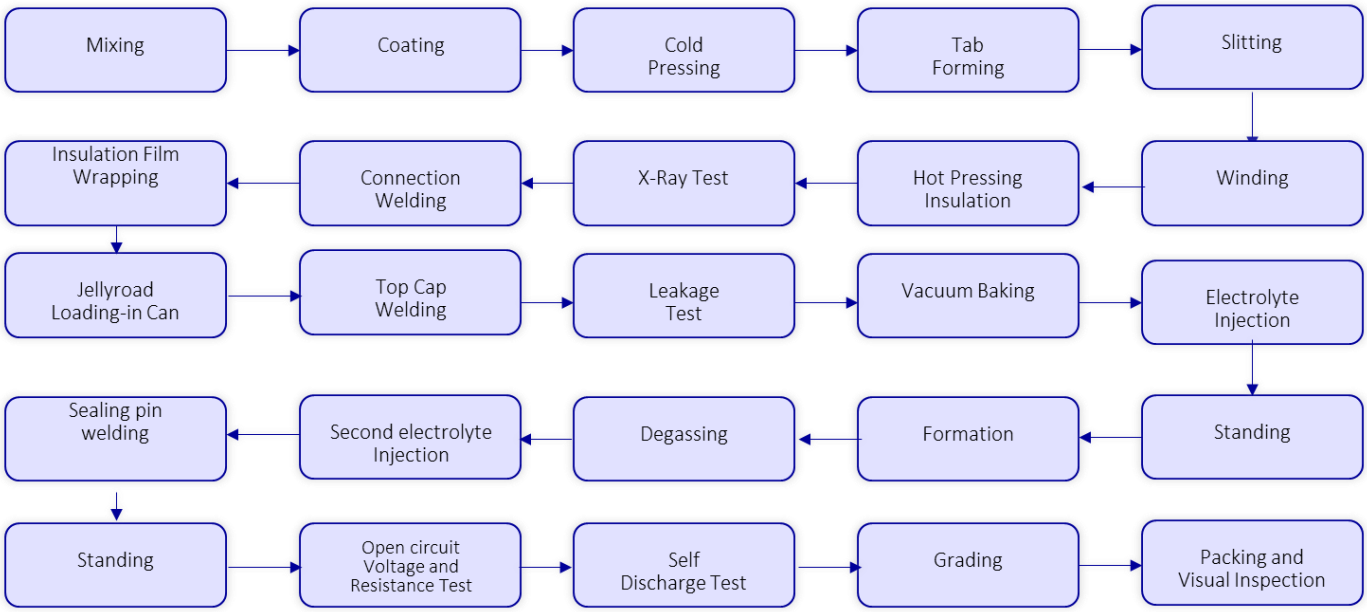
A tightly held market: ESS battery industry concentration in 2024

- The global ESS battery market is highly concentrated, with the top 5 manufacturers accounting for 73% of shipments in 2024, and the top 10 capturing 96%. The competitive landscape is dominated by a few major players, reflecting limited room for smaller entrants.

Battery manufacturing process

- Battery cell manufacturing is a highly complex process that demands strict environmental controls, including regulated cleanliness and humidity. Module and pack production involve precise assembly, welding, testing, and integration of components like BMS and cooling systems. Each stage is subject to rigorous quality checks to ensure safety, performance, and consistency before storage.
  - **Cell:** Battery cell manufacturing is a complex process that demands tightly controlled conditions, particularly in terms of cleanliness and humidity. The diagram outlines the key steps involved in the cell production.

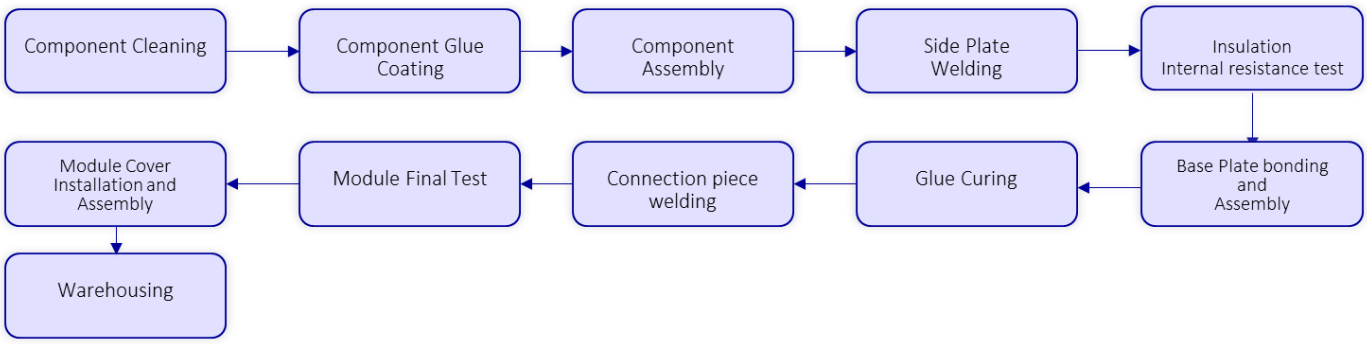
Exhibit 54: Cell manufacturing process



Source: CTDL, MOFSL

  - **Modules:** A module consists of multiple battery cells connected in series or parallel, depending on the required energy and voltage specifications. The diagram below details the main steps in the module manufacturing process.

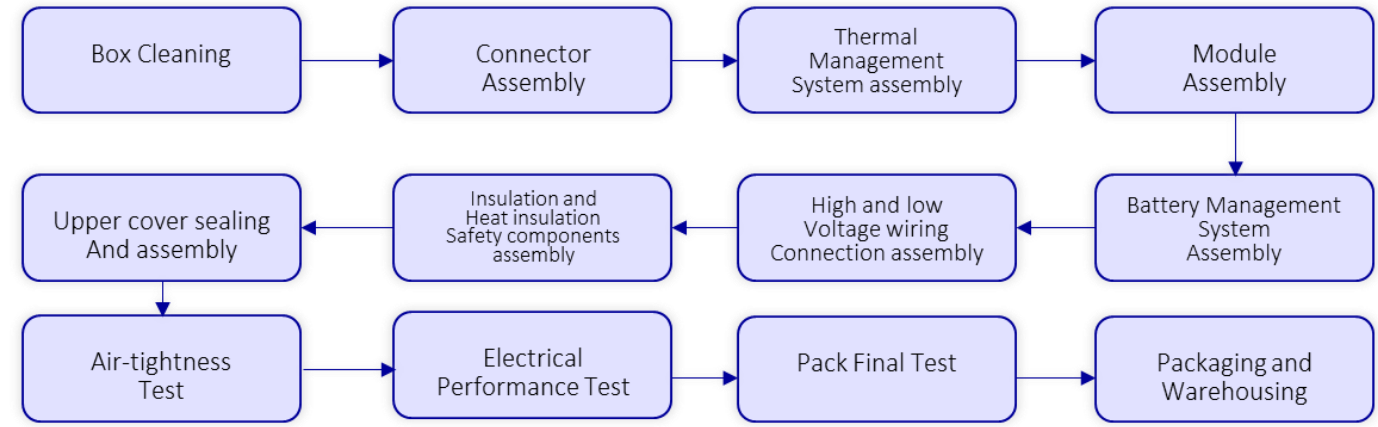
Exhibit 55: Module manufacturing process



Source: CTDL, MOFSL

  - **Packs:** A battery pack generally comprises modules, a battery management system (BMS), connectors, and a cooling system. The diagram below outlines the key steps in the pack manufacturing process.

Exhibit 56: Packs Manufacturing Process

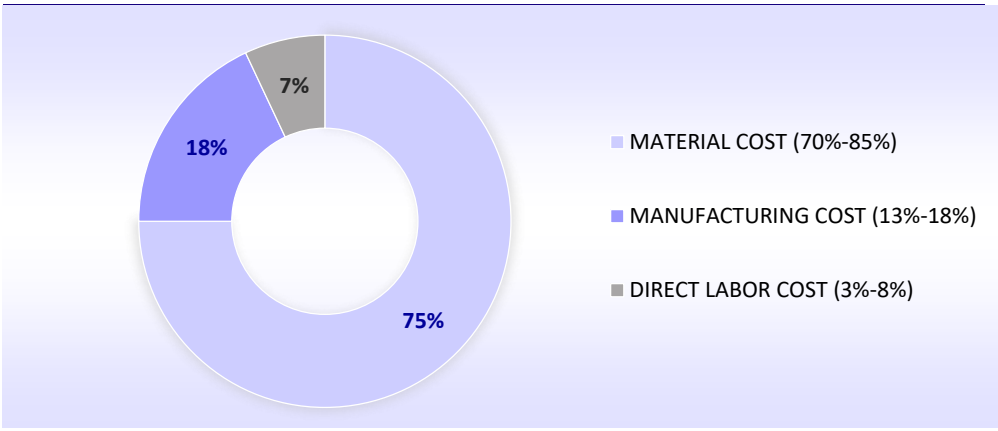


Source: CTDL, MOFSL

Battery price and cost dynamics

- Lithium-ion battery cells are primarily composed of a cathode, anode, separator, and electrolyte. Materials make up about 70% to 85% of the total cell cost, with cathode materials being the most significant cost driver.

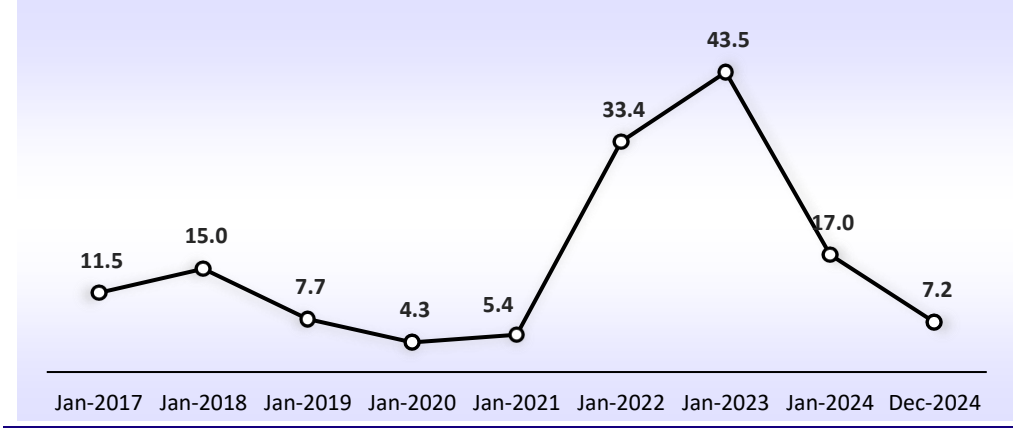
Exhibit 57: Cost structure of lithium-ion batteries



Source: GGII Report, MOFSL

- Lithium carbonate, a crucial raw material for lithium-ion battery cathodes, is highly sensitive to supply-demand dynamics within the industry. Its production and capacity expansion involve several stages such as extraction, beneficiation, and refining which typically require two to three years. Since 2020, surging demand from the new energy vehicles (NEV) and energy storage sectors, combined with constrained supply growth, led to a significant shortage and a sharp price spike. Lithium carbonate prices peaked at over CNY0.4m per ton in 4QCY22. However, as supply gradually improved, prices began to decline, falling to CNY0.07m per ton by Dec'24.

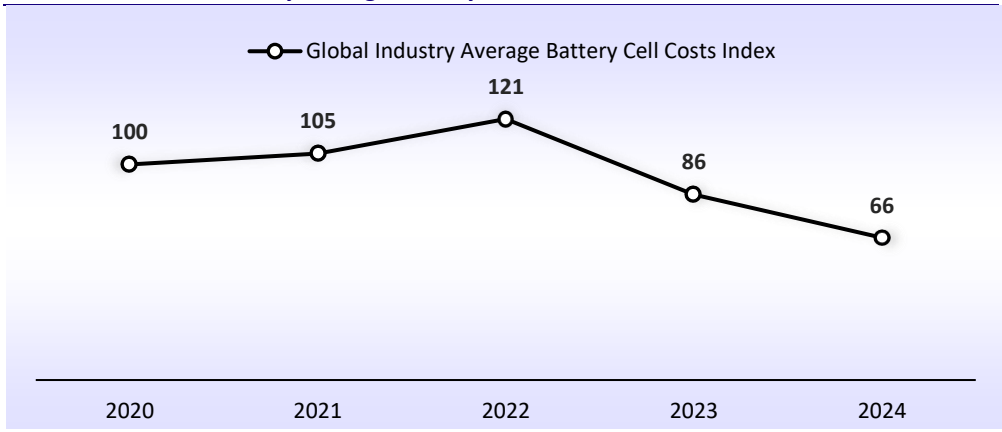
Exhibit 58: Global monthly average lithium carbonate price (VAT Inc.) – (CNY '000 per ton)



Source: GGII Report, MOFSL

- Driven by technological advancements and economies of scale, lithium-ion battery cell costs have generally declined over time. However, sharp increases in lithium carbonate prices during 2021 and 2022 led to a temporary rise in cell costs. As lithium carbonate prices dropped, battery cell costs steadily decreased through 2023 and 2024.

Exhibit 59: Global industry average battery cell costs index



Source: GGII Report, MOFSL

SWOT analysis

S – STRENGTH

- Largest solar PV module manufacturer in India with an installed capacity base of ~16GW
- Constant technological advancements and a 2.6 GW presence in the US market enhance global competitiveness and expand its international footprint
- Backward integrated with an operational 5.4GW cell line

W – WEAKNESS

- WEL is executing projects in modules, cells, and BESS, which are capex-intensive and complex and carry high execution and stabilization risks, which could affect profitability in the near to medium term.
- Reliance on Chinese raw material imports exposes WEL to supply chain disruptions and potential cost increases from trade restrictions or tariffs, resulting in margin loss.

O – OPPORTUNITY

- Government schemes favoring domestically made solar components (DCR) and PLI scheme incentivize and create significant market opportunities
- Expansion into ingots/ wafers, green hydrogen, battery components & RE power infrastructure positions them to capitalize on India's 500GW RE goal

T – THREATS

- Increasing competition from domestic players
- Dependence on export sales, particularly to the US, exposes WEL to international market volatility and potential revenue instability
- PLI funding delays or reductions, and subsidy uncertainty threaten project viability and require potential additional capital raising

Bull and Bear cases

Bull case

- ☑ In our bull case scenario, we anticipate 5% higher average realization/Wp for both the domestic and US module businesses for FY26/27/28 as opposed to our base case.
- ☑ We also anticipate effective capacity utilization to be higher by 5% vs. the base case over the same period.
- ☑ Based on the above assumptions, the company's bull case valuation would be INR5,895/sh.

Bear case

- ☑ In our bear case scenario, we anticipate 10% lower average realization/Wp for both the domestic and US module businesses for FY26/27/28 as opposed to our base case.
- ☑ We also anticipate effective capacity utilization to be lower by 5% vs. the base case over the same period.
- ☑ Based on the above assumptions, the company's bear case valuation would be INR2,174/sh.

Exhibit 60: Scenario analysis – Bull case

INR m	FY26E	FY27E	FY28E
Net revenue	3,01,561	3,85,443	4,34,778
EBITDA	86,274	1,04,059	1,12,475
PAT	60,338	69,584	76,817
Target price (INR)	**5,895**		
Upside (%)	**75%**		

Source: MOFSL, Company

Exhibit 61: Scenario analysis – Bear case

INR m	FY26E	FY27E	FY28E
Net revenue	2,29,480	2,96,343	3,41,752
EBITDA	34,957	43,788	48,841
PAT	20,132	21,977	25,698
Target price (INR)	**2,174**		
Downside (%)	**-35%**		

Source: MOFSL, Company

ESG initiatives

Environment

- The company is actively working to reduce its carbon footprint by transitioning to 100% renewable energy by 2030 (Scope 1 and 2; Scope 3 by 2040).
- The company is committed to reaching net zero emissions for Scopes 1 and 2 by 2030 and total net zero (Scope 3) by 2040.
- WEL is committed to environmental protection through efficient resource use. It embraces the Circular Economy's 5Rs (Refuse, Reduce, Reuse, Repurpose, Recycle). By maximizing resources, minimizing waste with technology, and reducing our carbon footprint via renewable energy and eco-friendly practices, it aims to lead in responsible resource management for a sustainable future.
- The company prioritizes suppliers with lower carbon footprints and actively encourages them to follow a green procurement policy.
- The company emphasizes regular maintenance, the use of low global warming potential refrigerants, implementation of recycling initiatives, and the development of energy-efficient modules—driven by ongoing investments in R&D — to optimize renewable energy generation.
- The company also promotes sustainable commuting by encouraging employees to use public transportation or electric vehicles.
- WEL became the first Indian solar company to secure an Environmental Product Declaration (EPD) certification.
- WEL maintains a ‘zero waste to landfill’ status for hazardous waste.
- Environmental achievements of FY25:
  - GHG emissions avoided amounted to 210 tons of CO2.
  - Energy efficiency initiatives saved 290.59m units of energy.
  - Replaced diesel-powered material handling equipment in plants with EVs.
  - About 25,000 KL of water was saved during the year due to management practices like using treated wastewater for gardening, washing roads, etc.

Social

- WEL demonstrates a commitment to sustainable value creation through strategic CSR initiatives. The company's CSR programs are aligned with the United Nations’ Sustainable Development Goals, indicating a focus on measurable societal impact.
- Over the past three fiscal years, the company has undertaken several noteworthy CSR initiatives. It partnered with a non-governmental organization to enhance health awareness and deliver free medical check-ups in rural communities. In collaboration with the Gujarat Labour Welfare Board, it facilitated regular health screenings for employees and unorganized workers, extending these services to their families.
- Additionally, the company worked with educational institutions such as ITI Bilimora, Anil Naik Training Institute Kharel, and S.S. Agarwal College (Navsari) to support skill development and job readiness for students, aiming to bridge the gap between education and employment.
- The company also places strong emphasis on expanding health and safety programs to safeguard employee well-being. This commitment fosters a

supportive work environment, strengthens workforce morale, and reinforces its broader responsibility toward sustainable and inclusive growth.

- The company has a strong workforce of 1,820 employees and 6,750 workers.
- The company's focus areas include competence of employees with 29,549 total training hours, which included 890 safety sessions for staff and 7,796 safety sessions for operators during FY25.
- WEL received no complaints of sexual harassment in FY25.

Governance

- WEL prioritizes strong corporate governance for trust and sustainable growth. Key pillars include strict business ethics and compliance, robust corporate governance, proactive risk and opportunity management, strong IT and cybersecurity, responsible sourcing, and effective customer relationship management. These practices aim to create long-term value and position it as a leader in renewable energy.
- It adopted a strong code of conduct and ethics for all employees and directors.
- WEL maintains a vigil mechanism (whistleblower policy), providing a formal mechanism for directors and employees to report concerns about unethical or improper activity, with direct access to the Audit Committee Chairman.
- WEL received the prestigious EcoVadis Gold Medal, ranking it among the top 5% of companies globally for its ESG practice.
- The company is strategically aligned with the science-based targets initiative (SBTi) and the UN Sustainable Development Goals (UNSDG).

Management Overview

Mr. Hitesh Chimanlal Doshi, Chairman and Managing Director

- With over 22 years of engineering industry experience, Mr. Hitesh provides strong leadership and drives the company's business strategies. He has been instrumental in the company's growth since 1999. His responsibilities encompass overseeing financial performance, strategic planning, and policy development. He holds a bachelor's degree in Commerce from the University of Mumbai and a Doctorate in Professional Entrepreneurship from the European Continental University.

Mr. Viren Chimanlal Doshi, Whole-time Director

- Mr. Viren has over 15 years of experience in the engineering industry. Since joining the company in Nov'07, he has been responsible for overseeing the engineering, procurement, and construction of solar projects for WEL, its subsidiaries, and other group companies. He holds a higher secondary certificate from the Maharashtra State Board of Secondary and Higher Secondary Education.

Mr. Hitesh Pranjivan Mehta, Whole-time Director

- Mr. Mehta brings over 23 years of experience in the engineering, solar, and oil industries to his role. He holds a Bachelor of Commerce degree from the University of Bombay and is a member of the Institute of Chartered Accountants of India.
- Since joining the Waaree Group as a director in Apr'11, he has been instrumental in shaping the company's strategic direction. His responsibilities include leading the development and implementation of both short- and long-term strategic goals. He previously served as a director at Waaree Instruments, further demonstrating his extensive industry knowledge.

Dr. Amit Ashok Paithankar (Whole-time Director and CEO)

- Dr. Amit is a seasoned industry leader with over 25 years of experience spanning Engineering, R&D, Manufacturing, IT, and General Management.
- He began his career in design engineering and manufacturing at Crompton Greaves, subsequently transitioning to R&D at ABB. Prior to joining WEL, Dr. Amit spent 20 years at Emerson, holding key leadership positions in sales and general management across India and the Asia Pacific region.
- Dr. Amit holds a Ph.D. in Technology, Electrical Engineering from the University of Mumbai, and an MBA from the London School of Business and Finance.

Financials and valuations

Consolidated Income Statement (INR m)

Y/E March	FY22	FY23	FY24	FY25	FY26E	FY27E	FY28E
Net Sales	**28,543**	**67,509**	**113,976**	**144,445**	**2,64,514**	**3,40,484**	**3,87,929**
Change (%)	*NA*	*137%*	*69%*	*27%*	*83%*	*29%*	*14%*
Total Expenses	27,433	59,162	98,232	117,229	2,04,905	2,66,970	3,07,607
EBITDA	**1,109**	**8,346**	**15,744**	**27,216**	**59,608**	**73,515**	**80,322**
EBITDAM (%)	*4%*	*12%*	*14%*	*19%*	*23%*	*22%*	*21%*
Depn. & Amortization	433	1,641	2,768	4,025	9,277	14,397	15,827
EBIT	**677**	**6,705**	**12,976**	**23,192**	**50,331**	**59,118**	**64,495**
Net Interest and finance cost	409	823	1,399	1,521	2,934	4,924	5,492
Other income	916	1,095	2,352	4,016	5,819	6,991	8,998
PBT before extraordinary items	**1,184**	**6,977**	**13,929**	**25,687**	**53,216**	**61,184**	**68,002**
EO income/ (expense)	-	(206)	3,413	(40)	-	-	-
PBT	**1,184**	**6,772**	**17,342**	**25,646**	**53,216**	**61,184**	**68,002**
Tax	387	1,769	4,598	6,365	12,772	14,378	15,300
Rate (%)	*33%*	*26%*	*27%*	*25%*	*24%*	*23%*	*23%*
JV/Associates	-	-	-	-	-	-	-
Profit from continued operations	**796**	**5,003**	**12,744**	**19,281**	**40,444**	**46,806**	**52,701**
Profit from Discontinued Operations before tax	-	-	-	-	-	-	-
Tax (Discontinued operations)	-	-	-	-	-	-	-
Reported PAT	**756**	**4,828**	**12,372**	**18,674**	**39,453**	**45,461**	**50,991**
Minority	40	175	372	607	991	1,345	1,711
Adjusted PAT	**756**	**4,980**	**9,863**	**18,704**	**39,453**	**45,461**	**50,991**
YoY change (%)	*NA*	*558%*	*98%*	*90%*	*111%*	*15%*	*12%*

Consolidated Balance Sheet (INR m)

As on Y/E March	FY22	FY23	FY24	FY25	FY26E	FY27E	FY28E
Share Capital	1,971	2,434	2,630	2,873	2,876	2,876	2,876
Reserves	2,305	15,950	38,249	91,919	1,30,222	1,74,532	2,24,372
Net Worth	**4,276**	**18,384**	**40,878**	**94,792**	**1,33,098**	**1,77,409**	**2,27,249**
Minority Interest	122	234	607	1,161	2,152	3,498	5,208
Total Loans	3,131	2,735	3,173	9,395	21,895	56,895	65,145
Capital Employed	**7,529**	**21,353**	**44,658**	**105,347**	**1,57,145**	**2,37,801**	**2,97,601**
Net Fixed Assets	**6,179**	**10,986**	**14,432**	**40,292**	**65,434**	**1,18,247**	**1,76,967**
Capital WIP	1,238	5,372	13,414	18,841	34,421	67,211	47,664
Goodwill	63	63	63	63	63	63	63
Investments	1,435	314	715	801	801	801	801
Curr. Assets	**13,459**	**57,464**	**84,513**	**137,476**	**1,67,418**	**1,75,899**	**2,05,250**
Inventories	5,382	27,089	25,855	26,921	50,729	65,298	74,397
Account Receivables	925	3,126	9,714	11,848	21,741	27,985	31,885
Cash and Cash Equivalents	3,664	17,364	37,792	77,478	73,719	61,387	77,739
Others	3,488	9,885	11,152	21,229	21,229	21,229	21,229
Curr. Liability & Prov.	**14,845**	**52,846**	**68,479**	**92,126**	**1,10,993**	**1,24,422**	**1,33,145**
Account Payables	5,348	14,316	14,752	22,549	41,416	54,844	63,568
Provisions & Others	9,497	38,530	53,727	69,577	69,577	69,577	69,577
Net Curr. Assets	**-1,386**	**4,618**	**16,034**	**45,350**	**56,425**	**51,478**	**72,105**
Appl. of Funds	**7,529**	**21,353**	**44,658**	**105,347**	**1,57,145**	**2,37,801**	**2,97,601**

Financials and valuations

Ratios							
Particulars	**FY22**	**FY23**	**FY24**	**FY25**	**FY26E**	**FY27E**	**FY28E**
Basic (INR)							
EPS	3.8	20.5	37.5	65.1	137.3	158.2	177.5
Cash EPS	6.0	27.2	48.0	79.1	169.6	208.4	232.6
BV/Share	21.7	75.5	155.5	330.0	463.3	617.5	791.0
DPS	0.0	0.0	0.0	0.0	4.0	4.0	4.0
Payout (%)	0.6	0.1	0.1	0.0	2.9	2.5	2.3
Dividend yield (%)	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Valuation (x)							
P/E	905.4	169.8	92.6	53.4	24.5	21.3	19.0
Cash P/E	575.9	127.7	72.3	43.9	19.9	16.2	14.5
P/BV	160.1	46.0	22.3	10.5	7.3	5.5	4.3
EV/EBITDA	616.8	99.5	55.8	34.2	15.4	13.1	11.9
Return Ratios (%)							
RoE	18%	44%	33%	28%	35%	29%	25%
RoCE (post-tax)	14%	40%	34%	27%	33%	26%	21%
RoIC (post-tax)	40%	-1571%	-210%	4166%	136%	58%	36%
Working Capital Ratios							
Fixed Asset Turnover (x)	4.6	6.1	7.9	3.6	4.0	2.9	2.2
Asset Turnover (x)	3.8	3.2	2.6	1.4	1.7	1.4	1.3
Debtor (Days)	12	17	31	30	30	30	30
Inventory (Days)	69	146	83	68	70	70	70
Payable (Days)	82	98	60	78	80	80	80
Working Capital (Days)	-1	65	54	20	20	20	20
Leverage Ratio (x)							
Net Debt/Equity	(0.1)	(0.8)	(0.8)	(0.7)	(0.4)	(0.0)	(0.1)
Net Debt/EBITDA	(0.5)	(1.8)	(2.2)	(2.5)	(0.9)	(0.1)	(0.2)

Consolidated Cash Flow Statement							(INR m)
Particulars	**FY22**	**FY23**	**FY24**	**FY25**	**FY26E**	**FY27E**	**FY28E**
Profit/(loss) for the year before tax	**1,184**	**6,772**	**17,342**	**25,646**	**53,216**	**61,184**	**68,002**
WC	5,344	7,196	5,916	11,574	(14,834)	(7,386)	(4,275)
Others	740	2,638	3,143	1,790	6,392	12,331	12,320
Direct taxes (net)	(259)	(1,004)	(3,351)	(7,428)	(12,772)	(14,378)	(15,300)
CF from Op. Activity	**7,009**	**15,602**	**23,050**	**31,582**	**32,002**	**51,752**	**60,746**
Capex	(4,957)	(8,618)	(13,374)	(32,456)	(50,000)	(1,00,000)	(55,000)
FCFF	**2,052**	**6,984**	**9,677**	**(874)**	**(17,998)**	**(48,248)**	**5,746**
Interest income	93	295	1,249	2,983	5,819	6,991	8,998
Others	(1,885)	(12,616)	(21,278)	(38,610)	-	-	-
CF from Inv. Activity	**(6,749)**	**(20,938)**	**(33,403)**	**(68,084)**	**(44,181)**	**(93,009)**	**(46,002)**
Share capital	-	10,194	10,035	35,080	4	-	-
Borrowings	1,407	(1,508)	416	6,221	12,500	35,000	8,250
Finance cost	(279)	(655)	(1,207)	(714)	(2,934)	(4,924)	(5,492)
Dividend	(5)	(3)	(5)	-	(1,151)	(1,151)	(1,151)
Others	(138)	(1,603)	(147)	(230)	-	-	-
CF from Fin. Activity	**985**	**6,425**	**9,092**	**40,357**	**8,419**	**28,925**	**1,608**
(Inc)/Dec in Cash	**1,245**	**1,089**	**(1,260)**	**3,856**	**(3,759)**	**(12,332)**	**16,352**
Opening balance	128	1,392	2,537	1,214	77,478	73,719	61,387
Closing balance (as per B/S)	**3,664**	**17,364**	**37,792**	**77,478**	**73,719**	**61,387**	**77,739**

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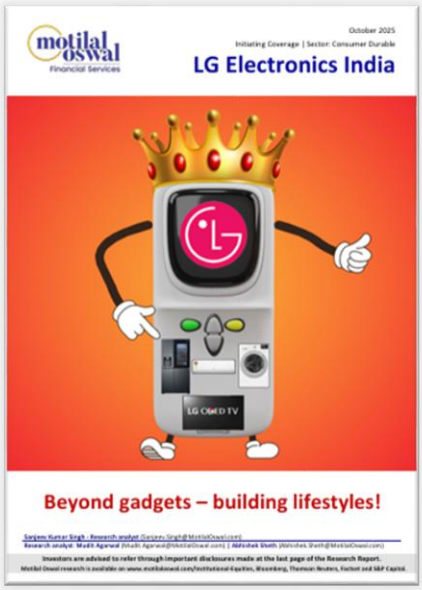

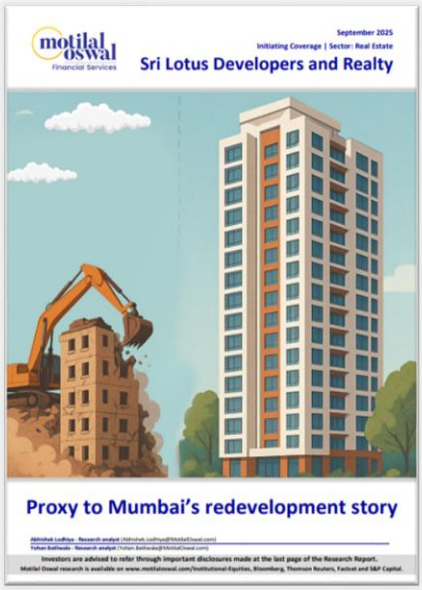

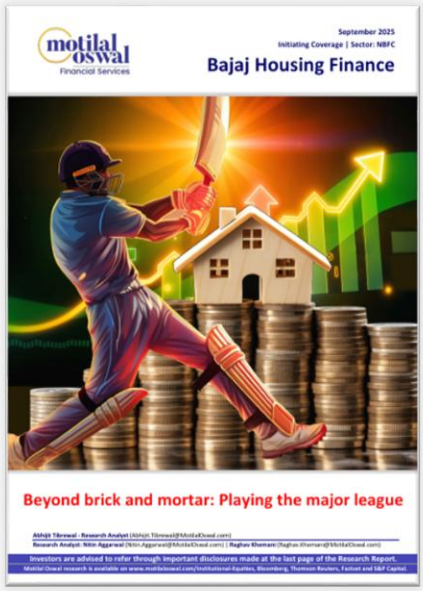

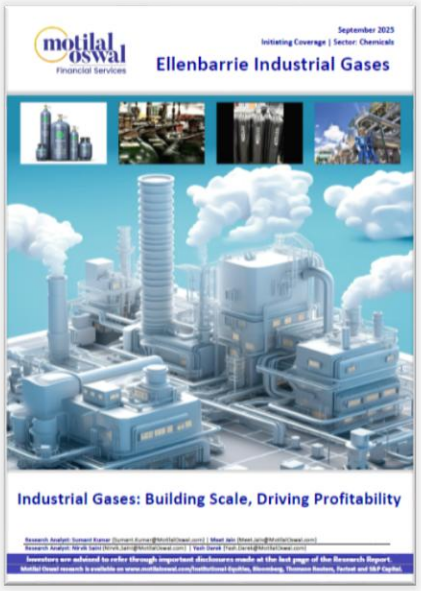

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BUY	>=15%
SELL	< - 10%
NEUTRAL	< - 10 % to 15%
UNDER REVIEW	Rating may undergo a change
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