Annexures

These annexures provide information on the data used in the report's analysis with regards to the market size of all BOM components, increase in the share of glass-glass modules in the Indian solar industry, and import trade data for all BOM components.

Annexure 1

Market opportunity calculation:

The individual cost of BOM components is mentioned in Table A1.

Table A1. BOM cost-component breakup

BOM component	BOM cost (USD per Wp)
Solar glass	0.0292
Aluminium frames	0.0236
PV ribbons	0.0096
Encapsulants	0.0103
Backsheets[1]	NA
Junction box	0.0029

Source: Data from SAMA as of September 2026

We assume full capacity utilisation of all BOM manufacturing facilities and calculate the current market size (y), as of September 2026, across the six BOM components by multiplying their individual manufacturing capacities (m) with their individual prices (p), as shown in equation (1) below:

$$y = m * p \#(1)$$

The market size for all BOM components is represented in Table A2.

Table A2. Market size across all BOM components

BOM component	Manufacturing capacity as of September 2026 (GW)	Cumulative manufacturing capacity expected to be commissioned by March 2028 (GW)	Market size as of September 2026 (USD billion)	Estimated market size by March 2028 (USD billion)
Solar glass	20	70	0.58	2.04
Aluminium frames	66	118.5	1.56	2.80

[1] Backsheet cost not been considered in the calculation due to its reduced demand.

PV ribbon	54.25	126	0.52	1.21
Encapsulants	49.5	122.5	0.51	1.26
Backsheets	28	28	0.00[2]	0.00
Junction box	153	163	0.44	0.47
Total			3.61	7.78

Source: Authors' analysis based on September 2026 data from SAMA

Annexure 2

Calculation for the increase in bifacial glass-glass module share

The bifacial glass-glass share is calculated as a capacity-weighted share, by multiplying each manufacturer's capacity (m_i) with its bifacial glass-glass model ratio (n_{bi}/n_i), summing across all manufacturers ($\Sigma_i m_i n_{bi}/n_i$), and dividing by total capacity (M). Hence, bifacial glass-glass share percentage, X, can be calculated as below:

$$X = \frac{\Sigma_i m_i n_{bi}/n_i}{M} * 100 \ \#(2)$$

For the ALMM List-I update on December 2025 (MNRE 2025), each individual term in the summation in the numerator in equation (2), is calculated in Table A3 below, in the sixth column.

Table A3. Out of 39,126 MW of the new enlisted manufacturing capacity, 29,481 MW is geared towards bifacial glass-glass models, making up 75%

Manufacturer	Capacity (MW) (m_i)	Number of models (n_i)	Number of bifacial glass–glass models (n_{bi})	Bifacial glass–glass ratio (n_{bi}/n_i)	Bifacial capacity (MW) ($m_i n_{bi}/n_i$)
Saatvik Solar	3,122	6	6	1	3,122
MKU Holdings	1,247	1	1	1	1,247
Macwin Solar	405	9	0	0	0
Waaree Energies	16,444	5	3	0.6	9,866.4
Eastman Green Technologies	374	18	7	0.39	145.86
Rayzon Solar	5,659	1	1	1	5,659
Frontier Energy	548	4	4	1	548

[2] The backsheet market size is not determined as backsheet demand has been rendered largely obsolete due to rise of glass–glass modules in the country.

ZNSHINE SOLARWORLD	1,552	4	4	1	1,552
Goldi Sun	3,384	1	1	1	3,384
Fujiyama Power Systems	355	5	1	0.2	71
Waaree Energies	1,095	1	1	1	1,095
Green Valley Motors	34	5	0	0	0
INOX Solar	1,274	1	0	0	0
Australian Premium Solar	622	5	0	0	0
SAEL Solar	220	1	0	0	0
Insolation Green	2,791	1	1	1	2,791
Total	39,126				29,481.26

Source: Authors' analysis of MNRE 2025. Updation of List I (Manufacturers and Models of Solar PV Modules) of ALMM Order, 2019 - Reg. Ministry of New and Renewable Energy.

The numerator $\Sigma_i m_i n_{bi}/n_i$ is calculated to be 29,481.26 MW, and total enlisted manufacturing capacity M is 39,126 MW. Hence, bifacial glass–glass share in the December 2025 update is 75 per cent, calculated according to equation (2).

For the ALMM List-I update on March 2026 (MNRE 2026), each individual term in the summation in the numerator in equation (4), is calculated in Table A4 below, in the sixth column.

Table A4. Out of 20,485 MW of the new enlisted manufacturing capacity, 19,712 MW is for bifacial glass-glass models, making up 96%

Manufacturer	Capacity (MW) (m_i)	Number of models (n_i)	Number of bifacial glass–glass models (n_{bi})	Bifacial glass–glass ratio (n_{bi}/n_i)	Bifacial capacity (MW) ($m_i n_{bi}/n_i$)
Startup Energy Pvt Ltd	1,034	5	5	1	1,034
Insolation Green Energy	4,282	6	6	1	4,282
Rajdeep Solar Energy	194	1	0	0	0

Swelect HHV Solar Photovoltaics	853	1	1	1	853
Vikram Solar	3,358	4	4	1	3,358
Nithin Sai Renewables	691	14	14	1	691
Army Solar Energy	622	4	4	1	622
Solex Energy	3,782	14	14	1	3,782
Sahjanand Green Energy	193	13	13	1	193
Macwin Solar Energy	408	12	12	1	408
Best Apartment	1,105	1	1	1	1,105
Websol Energy System	579	6	0	0	0
Goldi Sun	3,384	4	4	1	3,384
Total	20,485				19,712

Source: Authors' analysis of MNRE 2026. Updation of List I (Manufacturers and Models of Solar PV Modules) of ALMM Order, 2019 - Reg. Ministry of New and Renewable Energy.

The numerator $\Sigma_i m_i n_{bi}/n_i$ is calculated to be 19,712 MW, and total enlisted manufacturing capacity M is 20,485 MW. Hence, bifacial glass–glass share in the March 2026 update is 96 per cent, calculated according to equation (2).

Annexure 3

Import trade data for all BOM components is mentioned in the tables below.

Table A5. China remains the largest exporter of solar glass to India, while imports from Malaysia and Vietnam continue to increase

Year	China	Malaysia	Vietnam	Hong Kong	Thailand
Import in million square metres					
2020–21	6.79	16.56	0.08	0.04	0.01
2021–22	53.50	10.33	9.06	0.13	0.11

2022–23	36.66	12.02	11.71	0.40	0.57
2023–24	99.26	0.23	9.16	0.25	0.03
2024–25	299.99	27.64	6.34	1.61	0.24
2025–26	398.92	135.48	49.98	2.87	3.22

Source: MoCI 2026. "Trade Statistics." Ministry of Commerce and Industry.

Table A6. China leads exports of aluminium frames to India as imports from Vietnam and Malaysia have seen a major rise in FY26

Year	China	Vietnam	Italy	Malaysia	UAE
	Import in million kilograms				
2019–20	8.757	0.000	0.160	0.008	0.755
2020–21	5.494	0.000	0.074	0.005	0.482
2021–22	8.692	0.000	0.174	0.002	1.173
2022–23	11.033	0.000	0.195	0.000	0.682
2023–24	31.833	0.000	0.189	0.001	1.318
2024–25	80.271	1.924	0.090	0.964	1.727
2025–26	124.080	20.380	0.081	22.090	0.520

Source: MoCI 2026. "Trade Statistics." Ministry of Commerce and Industry.

Table A7. Imports of PV ribbons have drastically reduced from Thailand between FY2024 and FY2026

Years	China	Malaysia	Thailand
	Imports in million kilograms		
2020–21	0.878	4.443	20.322
2021–22	0.745	20.208	24.846
2022–23	1.562	19.567	29.444
2023–24	2.477	21.840	31.469
2024–25	5.274	14.557	17.356
2025–26	8.163	20.529	1.680

Source: MoCI 2026. "Trade Statistics." Ministry of Commerce and Industry.

Table A8. Thailand emerged as the largest exporter of encapsulants to India in FY26, overtaking China – the leading exporter in previous years

Year	China	Vietnam	Thailand	Korea
	Imports in million kilograms			
2020–21	5.093	1.119	0.884	0.553
2021–22	9.101	1.274	0.865	0.467
2022–23	24.277	2.610	1.318	0.351
2023–24	55.516	3.696	4.781	1.388
2024–25	56.831	47.824	18.550	14.102

2025–26	64.083	92.236	98.642	10.512

Source: MoCI 2026. "Trade Statistics." Ministry of Commerce and Industry.

Table A9. China is the largest exporter of backsheets to India

Year	China	Taiwan	Thailand	UAE
	Imports in million kilograms			
2020–21	11.764	3.907	9.020	0.405
2021–22	14.279	3.473	9.479	2.541
2022–23	20.077	5.996	11.431	4.571
2023–24	30.072	5.112	0.494	6.630
2024–25	44.524	4.449	6.369	6.425
2025–26	48.071	5.465	10.769	7.193

Source: MoCI 2026. "Trade Statistics." Ministry of Commerce and Industry.

Table A10. China is the single largest exporter of junction boxes to India

Years	China	USA
	Imports in million units	
2020–21	1.881	0.000
2021–22	2.556	0.009
2022–23	4.321	0.019
2023–24	12.569	0.020
2024–25	35.303	0.075
2025–26	86.879	0.046

Source: MoCI 2026. "Trade Statistics." Ministry of Commerce and Industry.

References

1. MNRE (Ministry of New and Renewable Energy). 2025. *Updation of List I (Manufacturers and Models of Solar PV Modules) of ALMM Order, 2019 - Reg.* Ministry of New and Renewable Energy. https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2025/12/2025122210240814883.pdf.
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