UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

Form 10-Q

(Mark one)

☒ **QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the quarterly period ended September 30, 2022

or

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from to

Commission file number: 001-33156

First Solar, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**20-4623678**
(State or other jurisdiction of incorporation or organization)	*(I.R.S. Employer Identification No.)*

350 West Washington Street, Suite 600
Tempe, Arizona 85288
(Address of principal executive offices, including zip code)

(602) 414-9300
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading symbol(s)	Name of each exchange on which registered
Common stock, $0.001 par value	FSLR	The NASDAQ Stock Market LLC

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☒	Accelerated filer	☐	Non-accelerated filer	☐
Smaller reporting company	☐	Emerging growth company	☐		

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

As of October 21, 2022, 106,605,610 shares of the registrant's common stock, $0.001 par value per share, were outstanding.

FIRST SOLAR, INC.

FORM 10-Q FOR THE QUARTERLY PERIOD ENDED SEPTEMBER 30, 2022

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PART I. FINANCIAL INFORMATION

Item 1. ***Condensed Consolidated Financial Statements (Unaudited)***

FIRST SOLAR, INC.
CONDENSED CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands, except per share amounts)
(Unaudited)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2022	2021	2022	2021
Net sales	$ 628,933	$ 583,504	$ 1,616,928	$ 2,016,058
Cost of sales	607,951	458,924	1,607,683	1,532,593
Gross profit	20,982	124,580	9,245	483,465
Operating expenses:				
Selling, general and administrative	46,368	43,476	121,990	131,909
Research and development	29,183	25,426	81,520	69,234
Production start-up	19,768	2,945	40,337	16,014
Total operating expenses	95,319	71,847	243,847	217,157
Gain on sales of businesses, net	5,984	(1,866)	253,272	147,284
Operating (loss) income	(68,353)	50,867	18,670	413,592
Foreign currency loss, net	(4,859)	(1,018)	(12,041)	(4,613)
Interest income	9,749	1,752	14,954	3,996
Interest expense, net	(2,991)	(2,958)	(9,092)	(10,577)
Other income (expense), net	4,774	(2,603)	2,679	2,598
(Loss) income before taxes	(61,680)	46,040	15,170	404,996
Income tax benefit (expense)	12,512	(837)	(51,788)	(67,673)
Net (loss) income	$ (49,168)	$ 45,203	$ (36,618)	$ 337,323
Net (loss) income per share:				
Basic	$ (0.46)	$ 0.43	$ (0.34)	$ 3.18
Diluted	$ (0.46)	$ 0.42	$ (0.34)	$ 3.16
Weighted-average number of shares used in per share calculations:				
Basic	106,596	106,320	106,532	106,241
Diluted	106,596	106,899	106,532	106,879

See accompanying notes to these condensed consolidated financial statements.

FIRST SOLAR, INC.
CONDENSED CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(In thousands)
(Unaudited)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2022	2021	2022	2021
Net (loss) income	$ (49,168)	$ 45,203	$ (36,618)	$ 337,323
Other comprehensive loss:				
Foreign currency translation adjustments	(12,403)	(1,915)	(40,698)	(11,341)
Unrealized loss on marketable securities and restricted marketable securities, net of tax of $697, $47, $2,624 and $1,134	(13,884)	(3,486)	(53,372)	(19,961)
Unrealized (loss) gain on derivative instruments, net of tax of $905, $153, $2,540 and $(545)	(3,333)	118	(9,418)	4,284
Other comprehensive loss	(29,620)	(5,283)	(103,488)	(27,018)
Comprehensive (loss) income	$ (78,788)	$ 39,920	$ (140,106)	$ 310,305

See accompanying notes to these condensed consolidated financial statements.

FIRST SOLAR, INC.
CONDENSED CONSOLIDATED BALANCE SHEETS
(In thousands, except share data)
(Unaudited)

	September 30, 2022	December 31, 2021
ASSETS		
Current assets:		
Cash and cash equivalents	$ 1,150,982	$ 1,450,654
Marketable securities	776,213	375,389
Accounts receivable trade, net	325,421	429,436
Accounts receivable unbilled, net	35,149	25,273
Inventories	810,660	666,299
Other current assets	240,325	244,192
Total current assets	3,338,750	3,191,243
Property, plant and equipment, net	3,124,079	2,649,587
PV solar power systems, net	153,915	217,293
Project assets	27,827	315,488
Deferred tax assets, net	64,101	59,162
Restricted marketable securities	182,208	244,726
Goodwill	14,462	14,462
Intangible assets, net	36,631	45,509
Inventories	239,644	237,512
Other assets	311,200	438,764
Total assets	$ 7,492,817	$ 7,413,746
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 188,280	$ 193,374
Income taxes payable	25,771	4,543
Accrued expenses	333,140	288,450
Current portion of long-term debt	5,435	3,896
Deferred revenue	235,293	201,868
Other current liabilities	28,349	34,747
Total current liabilities	816,268	726,878
Accrued solar module collection and recycling liability	120,173	139,145
Long-term debt	254,224	236,005
Other liabilities	473,815	352,167
Total liabilities	1,664,480	1,454,195
Commitments and contingencies		
Stockholders' equity:		
Common stock, $0.001 par value per share; 500,000,000 shares authorized; 106,605,913 and 106,332,315 shares issued and outstanding at September 30, 2022 and December 31, 2021, respectively	107	106
Additional paid-in capital	2,880,243	2,871,352
Accumulated earnings	3,147,837	3,184,455
Accumulated other comprehensive loss	(199,850)	(96,362)
Total stockholders' equity	5,828,337	5,959,551
Total liabilities and stockholders' equity	$ 7,492,817	$ 7,413,746

See accompanying notes to these condensed consolidated financial statements.

FIRST SOLAR, INC.
CONDENSED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(In thousands)
(Unaudited)

	Three Months Ended September 30, 2022					
	Common Stock		Additional Paid-In Capital	Accumulated Earnings	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount				
Balance at June 30, 2022	106,594	$ 107	$ 2,868,945	$ 3,197,005	$ (170,230)	$ 5,895,827
Net loss	—	—	—	(49,168)	—	(49,168)
Other comprehensive loss	—	—	—	—	(29,620)	(29,620)
Common stock issued for share-based compensation	15	—	—	—	—	—
Tax withholding related to vesting of restricted stock	(3)	—	(457)	—	—	(457)
Share-based compensation expense	—	—	11,755	—	—	11,755
Balance at September 30, 2022	106,606	$ 107	$ 2,880,243	$ 3,147,837	$ (199,850)	$ 5,828,337

	Three Months Ended September 30, 2021					
	Common Stock		Additional Paid-In Capital	Accumulated Earnings	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount				
Balance at June 30, 2021	106,319	$ 106	$ 2,859,108	$ 3,007,882	$ (83,461)	$ 5,783,635
Net income	—	—	—	45,203	—	45,203
Other comprehensive loss	—	—	—	—	(5,283)	(5,283)
Common stock issued for share-based compensation	8	—	—	—	—	—
Tax withholding related to vesting of restricted stock	(1)	—	(67)	—	—	(67)
Share-based compensation expense	—	—	6,587	—	—	6,587
Balance at September 30, 2021	106,326	$ 106	$ 2,865,628	$ 3,053,085	$ (88,744)	$ 5,830,075

See accompanying notes to these condensed consolidated financial statements.

FIRST SOLAR, INC.
CONDENSED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(In thousands)
(Unaudited)

	Nine Months Ended September 30, 2022					
	Common Stock		Additional Paid-In Capital	Accumulated Earnings	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2021	106,332	$ 106	$ 2,871,352	$ 3,184,455	$ (96,362)	$ 5,959,551
Net loss	—	—	—	(36,618)	—	(36,618)
Other comprehensive loss	—	—	—	—	(103,488)	(103,488)
Common stock issued for share-based compensation	441	1	—	—	—	1
Tax withholding related to vesting of restricted stock	(167)	—	(12,048)	—	—	(12,048)
Share-based compensation expense	—	—	20,939	—	—	20,939
Balance at September 30, 2022	106,606	$ 107	$ 2,880,243	$ 3,147,837	$ (199,850)	$ 5,828,337

	Nine Months Ended September 30, 2021					
	Common Stock		Additional Paid-In Capital	Accumulated Earnings	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2020	105,980	$ 106	$ 2,866,786	$ 2,715,762	$ (61,726)	$ 5,520,928
Net income	—	—	—	337,323	—	337,323
Other comprehensive loss	—	—	—	—	(27,018)	(27,018)
Common stock issued for share-based compensation	554	—	—	—	—	—
Tax withholding related to vesting of restricted stock	(208)	—	(15,877)	—	—	(15,877)
Share-based compensation expense	—	—	14,719	—	—	14,719
Balance at September 30, 2021	106,326	$ 106	$ 2,865,628	$ 3,053,085	$ (88,744)	$ 5,830,075

See accompanying notes to these condensed consolidated financial statements.

FIRST SOLAR, INC.
CONDENSED CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)
(Unaudited)

	Nine Months Ended September 30,	
	2022	**2021**
Cash flows from operating activities:		
Net (loss) income	$ (36,618)	$ 337,323
Adjustments to reconcile net (loss) income to cash provided by operating activities:		
Depreciation, amortization and accretion	199,183	194,606
Impairments and net losses on disposal of long-lived assets	62,793	9,083
Share-based compensation	21,121	14,974
Deferred income taxes	(4,600)	(13,450)
Gain on sales of businesses, net	(253,272)	(147,284)
Gains on sales of marketable securities and restricted marketable securities	—	(11,696)
Other, net	(6,998)	(2,909)
Changes in operating assets and liabilities:		
Accounts receivable, trade and unbilled	177,020	79,565
Other current assets	(28,615)	(52,275)
Inventories	(161,725)	(116,017)
Project assets and PV solar power systems	(160,300)	11,945
Other assets	(22,936)	(39,264)
Income tax receivable and payable	40,902	22,615
Accounts payable	(15,057)	879
Accrued expenses and other liabilities	282,398	(95,685)
Accrued solar module collection and recycling liability	(15,142)	10,682
Net cash provided by operating activities	78,154	203,092
Cash flows from investing activities:		
Purchases of property, plant and equipment	(576,704)	(345,399)
Purchases of marketable securities and restricted marketable securities	(2,278,125)	(1,107,704)
Proceeds from sales and maturities of marketable securities and restricted marketable securities	1,870,973	1,075,768
Proceeds from sales of businesses, net of cash and restricted cash sold	363,898	300,499
Other investing activities	(2,561)	(6,453)
Net cash used in investing activities	(622,519)	(83,289)
Cash flows from financing activities:		
Repayment of long-term debt	(75,896)	(38,471)
Proceeds from borrowings under long-term debt, net of discounts and issuance costs	297,405	45,138
Payments of tax withholdings for restricted shares	(12,048)	(15,877)
Net cash provided by (used in) financing activities	209,461	(9,210)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	39,866	1,687
Net (decrease) increase in cash, cash equivalents and restricted cash	(295,038)	112,280
Cash, cash equivalents and restricted cash, beginning of the period	1,455,837	1,273,594
Cash, cash equivalents and restricted cash, end of the period	$ 1,160,799	$ 1,385,874
Supplemental disclosure of noncash investing and financing activities:		
Property, plant and equipment acquisitions funded by liabilities	$ 163,147	$ 50,415
Proceeds to be received from sales of businesses	$ 72,689	$ —

See accompanying notes to these condensed consolidated financial statements.

FIRST SOLAR, INC.

NOTES TO CONDENSED CONSOLIDATED FINANCIAL STATEMENTS
(Unaudited)

1. Basis of Presentation

The accompanying unaudited condensed consolidated financial statements of First Solar, Inc. and its subsidiaries in this Quarterly Report have been prepared in accordance with generally accepted accounting principles in the United States of America ("U.S. GAAP") for interim financial information and pursuant to the instructions to Form 10-Q and Article 10 of Regulation S-X of the Securities and Exchange Commission (the "SEC"). Accordingly, these interim financial statements do not include all of the information and footnotes required by U.S. GAAP for annual financial statements. In the opinion of First Solar management, all adjustments (consisting only of normal recurring adjustments) considered necessary for a fair statement have been included.

The preparation of condensed consolidated financial statements in conformity with U.S. GAAP requires us to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes. Despite our intention to establish accurate estimates and reasonable assumptions, actual results could differ materially from such estimates and assumptions. Operating results for the three and nine months ended September 30, 2022 are not necessarily indicative of the results that may be expected for the year ending December 31, 2022 or for any other period. The condensed consolidated balance sheet at December 31, 2021 has been derived from the audited consolidated financial statements at that date, but does not include all of the information and footnotes required by U.S. GAAP for complete financial statements. These interim financial statements and notes should be read in conjunction with the audited financial statements and notes thereto for the year ended December 31, 2021 included in our Annual Report on Form 10-K, which has been filed with the SEC.

Unless expressly stated or the context otherwise requires, the terms "the Company," "we," "us," "our," and "First Solar" refer to First Solar, Inc. and its consolidated subsidiaries, and the term "condensed consolidated financial statements" refers to the accompanying unaudited condensed consolidated financial statements contained in this Quarterly Report.

2. Sales of Businesses

Sale of Japan Project Development Business

In May 2022, we entered into various agreements with certain subsidiaries of PAG Real Assets ("PAG"), a private investment firm, for the sale of our Japan project development business. The transaction included our approximately 293 MW_{DC} utility-scale solar project development platform, which comprised the business of developing, contracting for the construction of, and selling utility-scale photovoltaic ("PV") solar power systems. Additionally, PAG agreed to certain module purchase commitments.

In June 2022, we completed the sale of our Japan project development business for an aggregate purchase price of ¥66.4 billion ($488.4 million), subject to certain customary post-closing adjustments. During the nine months ended September 30, 2022, we received proceeds of ¥56.8 billion ($419.2 million) and transferred cash and restricted cash of ¥8.4 billion ($61.9 million) to PAG. As a result of this transaction, we recognized a gain of $245.2 million, net of transaction costs, during the nine months ended September 30, 2022, which was included in "Gain on sales of businesses, net" in our condensed consolidated statements of operations.

Sales of North American and International O&M Operations

In August 2020, we entered into an agreement with a subsidiary of Clairvest Group, Inc. (“Clairvest”) for the sale of our North American operations and maintenance (“O&M”) operations. In March 2021, we completed the transaction and, following certain customary post-closing adjustments, received total consideration of $149.1 million. As a result of this transaction, we recognized a gain of $115.8 million, net of transaction costs and post-closing adjustments, during the nine months ended September 30, 2021, which was included in “Gain on sales of businesses, net” in our condensed consolidated statements of operations.

In January 2022, we completed the sale of our Chilean O&M operations to a separate subsidiary of Clairvest for consideration of $1.9 million. As a result of this transaction, we recognized a gain of $1.6 million, net of transaction costs and post-closing adjustments, during the nine months ended September 30, 2022, which was included in “Gain on sales of businesses, net” in our condensed consolidated statements of operations.

In September 2022, we completed the sale of our Australian O&M operations to a separate subsidiary of Clairvest for consideration of $6.6 million, subject to certain customary post-closing adjustments. Proceeds from the transaction were received in early October 2022. As a result of this transaction, we recognized a gain of $5.1 million, net of transaction costs, during the three months ended September 30, 2022, which was included in “Gain on sales of businesses, net” in our condensed consolidated statements of operations.

In September 2022, we also completed the sale of our Japanese O&M operations to a subsidiary of PAG for consideration of ¥660.0 million ($4.6 million), subject to certain customary post-closing adjustments. As a result of this transaction, we recognized a gain of $1.2 million, net of transaction costs, during the three months ended September 30, 2022, which was included in “Gain on sales of businesses, net” in our condensed consolidated statements of operations.

Sale of U.S. Project Development Business

In January 2021, we entered into an agreement with Leeward Renewable Energy Development, LLC (“Leeward”), a subsidiary of the Ontario Municipal Employees Retirement System, for the sale of our U.S. project development business. In March 2021, we completed the transaction and received consideration of $151.4 million for the sale of such business. As a result of this transaction, we recognized a gain of $31.5 million, net of transaction costs, during the nine months ended September 30, 2021, which was included in “Gain on sales of businesses, net” in our condensed consolidated statements of operations.

3. Cash, Cash Equivalents, and Marketable Securities

Cash, cash equivalents, and marketable securities consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Cash and cash equivalents:		
Cash	$ 1,150,787	$ 1,450,654
Money market funds	195	—
Total cash and cash equivalents	1,150,982	1,450,654
Marketable securities:		
Foreign debt	62,880	103,317
U.S. debt	56,406	18,627
Time deposits	656,927	253,445
Total marketable securities	776,213	375,389
Total cash, cash equivalents, and marketable securities	$ 1,927,195	$ 1,826,043

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within our condensed consolidated balance sheets as of September 30, 2022 and December 31, 2021 to the total of such amounts as presented in the condensed consolidated statements of cash flows (in thousands):

	Balance Sheet Line Item	September 30, 2022	December 31, 2021
Cash and cash equivalents	Cash and cash equivalents	$ 1,150,982	$ 1,450,654
Restricted cash – current	Other current assets	989	1,532
Restricted cash – noncurrent	Other assets	8,828	3,651
Total cash, cash equivalents, and restricted cash		$ 1,160,799	$ 1,455,837

During the nine months ended September 30, 2021, we sold marketable securities for proceeds of $5.5 million and realized gains of less than $0.1 million on such sales. See Note 8. “Fair Value Measurements” to our condensed consolidated financial statements for information about the fair value of our marketable securities.

The following tables summarize the unrealized gains and losses related to our available-for-sale marketable securities, by major security type, as of September 30, 2022 and December 31, 2021 (in thousands):

	As of September 30, 2022				
	Amortized Cost	Unrealized Gains	Unrealized Losses	Allowance for Credit Losses	Fair Value
Foreign debt	$ 62,932	$ 22	$ 64	$ 10	$ 62,880
U.S. debt	58,247	—	1,824	17	56,406
Time deposits	657,162	—	—	235	656,927
Total	$ 778,341	$ 22	$ 1,888	$ 262	$ 776,213

	As of December 31, 2021				
	Amortized Cost	Unrealized Gains	Unrealized Losses	Allowance for Credit Losses	Fair Value
Foreign debt	$ 103,263	$ 81	$ 18	$ 9	$ 103,317
U.S. debt	19,003	10	384	2	18,627
Time deposits	253,531	—	—	86	253,445
Total	$ 375,797	$ 91	$ 402	$ 97	$ 375,389

The following table presents the change in the allowance for credit losses related to our available-for-sale marketable securities for the nine months ended September 30, 2022 and 2021 (in thousands):

	Nine Months Ended September 30,	
	2022	2021
Allowance for credit losses, beginning of period	$ 97	$ 121
Provision for credit losses, net	311	329
Sales and maturities of marketable securities	(146)	(317)
Allowance for credit losses, end of period	$ 262	$ 133

The contractual maturities of our marketable securities as of September 30, 2022 were as follows (in thousands):

	Fair Value
One year or less	$ 662,925
One year to two years	73,153
Two years to three years	31,873
Three years to four years	4,384
Four years to five years	—
More than five years	3,878
Total	$ 776,213

4. Restricted Marketable Securities

Restricted marketable securities consisted of the following as of September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Foreign government obligations	$ 45,448	$ 64,855
Supranational debt	8,625	10,997
U.S. debt	110,859	145,326
U.S. government obligations	17,276	23,548
Total restricted marketable securities	$ 182,208	$ 244,726

Our restricted marketable securities represent long-term investments to fund the estimated future cost of collecting and recycling modules covered under our solar module collection and recycling program. We have established a trust under which estimated funds are put into custodial accounts with an established and reputable bank, for which First Solar, Inc.; First Solar Malaysia Sdn. Bhd.; and First Solar Manufacturing GmbH are grantors. As of September 30, 2022 and December 31, 2021, such custodial accounts also included noncurrent restricted cash balances of $6.3 million and $0.9 million, respectively, which were reported within “Other assets.” Trust funds may be disbursed for qualified module collection and recycling costs (including capital and facility related recycling costs), payments to customers for assuming collection and recycling obligations, and reimbursements of any overfunded amounts. Investments in the trust must meet certain investment quality criteria comparable to highly rated government or agency bonds. As necessary, we fund any incremental amounts for our estimated collection and recycling obligations on an annual basis based on the estimated costs of collecting and recycling covered modules, estimated rates of return on our restricted marketable securities, and an estimated solar module life of 25 years, less amounts already funded in prior years.

During the nine months ended September 30, 2021, we sold all our restricted marketable securities for proceeds of $258.9 million and realized gains of $11.7 million on such sales, and repurchased $255.6 million of restricted marketable securities as part of our ongoing management of the custodial accounts. See Note 8. "Fair Value Measurements" to our condensed consolidated financial statements for information about the fair value of our restricted marketable securities.

The following tables summarize the unrealized gains and losses related to our restricted marketable securities, by major security type, as of September 30, 2022 and December 31, 2021 (in thousands):

	As of September 30, 2022				
	Amortized Cost	Unrealized Gains	Unrealized Losses	Allowance for Credit Losses	Fair Value
Foreign government obligations	$ 60,333	$ —	$ 14,875	$ 10	$ 45,448
Supranational debt	11,201	—	2,576	—	8,625
U.S. debt	148,733	—	37,846	28	110,859
U.S. government obligations	24,574	—	7,294	4	17,276
Total	$ 244,841	$ —	$ 62,591	$ 42	$ 182,208

	As of December 31, 2021				
	Amortized Cost	Unrealized Gains	Unrealized Losses	Allowance for Credit Losses	Fair Value
Foreign government obligations	$ 66,867	$ —	$ 2,002	$ 10	$ 64,855
Supranational debt	11,362	—	365	—	10,997
U.S. debt	150,060	—	4,697	37	145,326
U.S. government obligations	24,640	—	1,086	6	23,548
Total	$ 252,929	$ —	$ 8,150	$ 53	$ 244,726

The following table presents the change in the allowance for credit losses related to our restricted marketable securities for the nine months ended September 30, 2022 and 2021 (in thousands):

	Nine Months Ended September 30,	
	2022	2021
Allowance for credit losses, beginning of period	$ 53	$ 13
Provision for credit losses, net	(11)	69
Sales of restricted marketable securities	—	(29)
Allowance for credit losses, end of period	$ 42	$ 53

As of September 30, 2022, the contractual maturities of our restricted marketable securities were between 8 years and 17 years.

5. Consolidated Balance Sheet Details

Accounts receivable trade, net

Accounts receivable trade, net consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Accounts receivable trade, gross	$ 325,991	$ 430,100
Allowance for credit losses	(570)	(664)
Accounts receivable trade, net	$ 325,421	$ 429,436

Accounts receivable unbilled, net

Accounts receivable unbilled, net consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Accounts receivable unbilled, gross	$ 35,149	$ 25,336
Allowance for credit losses	—	(63)
Accounts receivable unbilled, net	$ 35,149	$ 25,273

Allowance for credit losses

The following tables present the change in the allowances for credit losses related to our accounts receivable for the nine months ended September 30, 2022 and 2021 (in thousands):

	Nine Months Ended September 30,	
Accounts receivable trade	**2022**	**2021**
Allowance for credit losses, beginning of period	$ 664	$ 3,009
Provision for credit losses, net	81	(1,458)
Writeoffs	(175)	(121)
Allowance for credit losses, end of period	$ 570	$ 1,430

	Nine Months Ended September 30,	
Accounts receivable unbilled	**2022**	**2021**
Allowance for credit losses, beginning of period	$ 63	$ 303
Provision for credit losses, net	(63)	(252)
Allowance for credit losses, end of period	$ —	$ 51

Inventories

Inventories consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Raw materials	$ 382,552	$ 404,727
Work in process	59,764	65,573
Finished goods	607,988	433,511
Inventories	$ 1,050,304	$ 903,811
Inventories – current	$ 810,660	$ 666,299
Inventories – noncurrent	$ 239,644	$ 237,512

Other current assets

Other current assets consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Spare maintenance materials and parts	$ 112,796	$ 112,070
Prepaid expenses	47,289	28,232
Operating supplies	43,458	41,034
Prepaid income taxes	13,550	41,379
Derivative instruments (1)	11,247	5,816
Restricted cash	989	1,532
Other	10,996	14,129
Other current assets	$ 240,325	$ 244,192

(1) See Note 6. “Derivative Financial Instruments” to our condensed consolidated financial statements for discussion of our derivative instruments.

Property, plant and equipment, net

Property, plant and equipment, net consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Land	$ 17,703	$ 18,359
Buildings and improvements	874,533	693,289
Machinery and equipment	2,719,789	2,527,627
Office equipment and furniture	144,223	139,611
Leasehold improvements	40,124	40,517
Construction in progress	724,211	461,708
Property, plant and equipment, gross	4,520,583	3,881,111
Accumulated depreciation	(1,396,504)	(1,231,524)
Property, plant and equipment, net	$ 3,124,079	$ 2,649,587

Depreciation of property, plant and equipment was $61.6 million and $180.2 million for the three and nine months ended September 30, 2022, respectively, and $59.1 million and $174.7 million for the three and nine months ended September 30, 2021, respectively.

PV solar power systems, net

PV solar power systems, net consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
PV solar power systems, gross	$ 225,193	$ 281,660
Accumulated depreciation	(71,278)	(64,367)
PV solar power systems, net	$ 153,915	$ 217,293

Depreciation of PV solar power systems was $2.0 million and $7.1 million for the three and nine months ended September 30, 2022, respectively, and $3.0 million and $8.9 million for the three and nine months ended September 30, 2021, respectively.

We evaluate our PV solar power systems for impairment under a held and used impairment model whenever events or changes in circumstances arise that may indicate that the carrying amount of a particular system may not be recoverable. Such events or changes may include a significant decrease in the market price of the asset, current-period operating or cash flow losses combined with a history of such losses or a projection of future losses associated with the use of the asset, and changes in expectations regarding our intent to hold the asset on a long-term basis or the timing of a potential asset disposition.

During the nine months ended September 30, 2022, we received multiple non-binding offers to purchase our Luz del Norte PV solar power plant and elected to pursue such opportunities in coordination with the project's lenders. As a result of the expected sale in the near term, we compared the undiscounted future cash flows for the project to its carrying value and determined that the project was not recoverable. Accordingly, we measured the fair value of the project using a market approach valuation technique and recorded an impairment loss of $57.8 million in "Cost of sales" in our condensed consolidated statements of operations during the nine months ended September 30, 2022. Such impairment loss was comprised of $55.6 million for PV solar power systems, $1.3 million for intangible assets, and $0.9 million for operating lease assets. In October 2022, we entered into an agreement to sell the project, which, subject to Chilean antitrust approval, is expected to be completed in late 2022.

Project assets

Project assets consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Project assets – development costs, including project acquisition and land costs	$ 27,827	$ 117,407
Project assets – construction costs	—	198,081
Project assets	$ 27,827	$ 315,488

In June 2022, we completed the sale of the majority of our project assets to PAG in connection with the sale of our Japan project development business. See Note 2. "Sales of Businesses" to our condensed consolidated financial statements for further information about this transaction.

Goodwill

Goodwill for the relevant reporting unit consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	December 31, 2021	Acquisitions (Impairments)	September 30, 2022
Modules	$ 407,827	$ —	$ 407,827
Accumulated impairment losses	(393,365)	—	(393,365)
Goodwill	$ 14,462	$ —	$ 14,462

Intangible assets, net

Intangible assets, net consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022			
	Gross Amount	Accumulated Amortization	Accumulated Impairments	Net Amount
Developed technology	$ 100,606	$ (69,409)	$ —	$ 31,197
Power purchase agreements	6,486	(1,842)	(1,300)	3,344
Patents	8,480	(6,390)	—	2,090
Intangible assets, net	$ 115,572	$ (77,641)	$ (1,300)	$ 36,631

	December 31, 2021		
	Gross Amount	Accumulated Amortization	Net Amount
Developed technology	$ 99,964	$ (61,985)	$ 37,979
Power purchase agreements	6,486	(1,621)	4,865
Patents	8,480	(5,815)	2,665
Intangible assets, net	$ 114,930	$ (69,421)	$ 45,509

Amortization of intangible assets was $2.7 million and $8.2 million for the three and nine months ended September 30, 2022 and 2021, respectively.

Other assets

Other assets consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Operating lease assets (1)	$ 97,861	$ 207,544
Advance payments for raw materials	81,619	86,962
Income tax receivables	47,235	39,862
Accounts receivable unbilled, net	11,488	20,840
Accounts receivable trade, net	9,645	21,293
Restricted cash	8,828	3,651
Indirect tax receivables	351	21,873
Other	54,173	36,739
Other assets	$ 311,200	$ 438,764

(1) See Note 7. “Leases” to our condensed consolidated financial statements for discussion of our lease arrangements.

Accrued expenses

Accrued expenses consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Accrued property, plant and equipment	$ 124,950	$ 42,031
Accrued freight	77,482	61,429
Accrued compensation and benefits	37,138	34,606
Accrued inventory	37,037	42,170
Accrued other taxes	12,472	23,103
Product warranty liability (1)	11,039	13,598
Accrued project costs	5,618	48,836
Other	27,404	22,677
Accrued expenses	$ 333,140	$ 288,450

(1) See Note 10. "Commitments and Contingencies" to our condensed consolidated financial statements for discussion of our "Product Warranties."

Other current liabilities

Other current liabilities consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Derivative instruments (1)	$ 12,892	$ 3,550
Operating lease liabilities (2)	8,907	12,781
Other taxes payable	1,813	8,123
Other	4,737	10,293
Other current liabilities	$ 28,349	$ 34,747

(1) See Note 6. "Derivative Financial Instruments" to our condensed consolidated financial statements for discussion of our derivative instruments.

(2) See Note 7. "Leases" to our condensed consolidated financial statements for discussion of our lease arrangements.

Other liabilities

Other liabilities consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022	December 31, 2021
Deferred revenue	$ 348,940	$ 95,943
Operating lease liabilities (1)	44,655	145,912
Deferred tax liabilities, net	24,812	27,699
Product warranty liability (2)	23,946	38,955
Other	31,462	43,658
Other liabilities	$ 473,815	$ 352,167

(1) See Note 7. "Leases" to our condensed consolidated financial statements for discussion of our lease arrangements.

(2) See Note 10. "Commitments and Contingencies" to our condensed consolidated financial statements for discussion of our "Product Warranties."

6. Derivative Financial Instruments

As a global company, we are exposed in the normal course of business to interest rate, foreign currency, and commodity price risks that could affect our financial position, results of operations, and cash flows. We use derivative instruments to hedge against these risks and only hold such instruments for hedging purposes, not for speculative or trading purposes.

Depending on the terms of the specific derivative instruments and market conditions, some of our derivative instruments may be assets and others liabilities at any particular balance sheet date. We report all of our derivative instruments at fair value and account for changes in the fair value of derivative instruments within “Accumulated other comprehensive loss” if the derivative instruments qualify for hedge accounting. For those derivative instruments that do not qualify for hedge accounting (i.e., “economic hedges”), we record the changes in fair value directly to earnings. See Note 8. “Fair Value Measurements” to our condensed consolidated financial statements for information about the techniques we use to measure the fair value of our derivative instruments.

The following tables present the fair values of derivative instruments included in our condensed consolidated balance sheets as of September 30, 2022 and December 31, 2021 (in thousands):

	September 30, 2022		
	Other Current Assets	Other Current Liabilities	Other Liabilities
Derivatives designated as hedging instruments:			
Foreign exchange forward contracts	$ 4,341	$ —	$ —
Commodity swap contracts	—	9,133	840
Total derivatives designated as hedging instruments	$ 4,341	$ 9,133	$ 840
Derivatives not designated as hedging instruments:			
Foreign exchange forward contracts	$ 6,906	$ 3,759	$ —
Total derivatives not designated as hedging instruments	$ 6,906	$ 3,759	$ —
Total derivative instruments	$ 11,247	$ 12,892	$ 840

	December 31, 2021	
	Other Current Assets	Other Current Liabilities
Derivatives designated as hedging instruments:		
Foreign exchange forward contracts	$ 1,336	$ 139
Total derivatives designated as hedging instruments	$ 1,336	$ 139
Derivatives not designated as hedging instruments:		
Foreign exchange forward contracts	$ 4,480	$ 3,411
Total derivatives not designated as hedging instruments	$ 4,480	$ 3,411
Total derivative instruments	$ 5,816	$ 3,550

The following table presents the pretax amounts related to derivative instruments designated as cash flow hedges affecting accumulated other comprehensive income (loss) and our condensed consolidated statements of operations for the nine months ended September 30, 2022 and 2021 (in thousands):

	Foreign Exchange Forward Contracts	Commodity Swap Contracts	Total
Balance as of December 31, 2021	$ 1,126	$ —	$ 1,126
Amounts recognized in other comprehensive income (loss)	545	(10,832)	(10,287)
Amounts reclassified to earnings impacting:			
Cost of sales	(1,671)	—	(1,671)
Balance as of September 30, 2022	$ —	$ (10,832)	$ (10,832)
Balance as of December 31, 2020	$ (3,644)	$ 1,472	$ (2,172)
Amounts recognized in other comprehensive income (loss)	2,268	1,531	3,799
Amounts reclassified to earnings impacting:			
Cost of sales	1,913	(883)	1,030
Balance as of September 30, 2021	$ 537	$ 2,120	$ 2,657

During the nine months ended September 30, 2022, we recognized unrealized losses of less than $0.1 million within “Cost of sales” for amounts excluded from effectiveness testing for our foreign exchange forward contracts designated as cash flow hedges. During the three and nine months ended September 30, 2021, we recognized unrealized gains of less than $0.1 million and unrealized losses of less than $0.1 million, respectively, within “Cost of sales” for amounts excluded from effectiveness testing for our foreign exchange forward contracts designated as cash flow hedges.

The following table presents the pretax amounts related to derivative instruments designated as net investment hedges affecting accumulated other comprehensive income (loss) and our condensed consolidated statements of operations for the nine months ended September 30, 2022 (in thousands):

	Foreign Exchange Forward Contracts
Balance as of December 31, 2021	$ —
Amounts recognized in other comprehensive income (loss)	4,341
Balance as of September 30, 2022	$ 4,341

During the three and nine months ended September 30, 2022, we recognized unrealized gains of $0.4 million and $0.5 million, respectively, within “Other income (expense), net” for amounts excluded from effectiveness testing for our derivative instruments designated as net investment hedges.

The following table presents gains and losses related to derivative instruments not designated as hedges affecting our condensed consolidated statements of operations for the three and nine months ended September 30, 2022 and 2021 (in thousands):

		Amount of Gain (Loss) Recognized in Income			
		Three Months Ended September 30,		Nine Months Ended September 30,	
	Income Statement Line Item	2022	2021	2022	2021
Foreign exchange forward contracts	Cost of sales	$ 55	$ 103	$ 577	$ (174)
Foreign exchange forward contracts	Foreign currency loss, net	7,905	1,802	71,420	10,821
Interest rate swap contracts	Interest expense, net	—	96	—	(595)

Interest Rate Risk

From time to time, we may use interest rate swap contracts to mitigate our exposure to interest rate fluctuations associated with certain of our debt instruments. We do not use such swap contracts for speculative or trading purposes. During the nine months ended September 30, 2021, all of our interest rate swap contracts related to project specific debt facilities. Such swap contracts did not qualify for accounting as cash flow hedges in accordance with Accounting Standards Codification ("ASC") 815 due to our expectation to sell the associated projects before the maturity of their project specific debt financings and corresponding swap contracts. Accordingly, changes in the fair values of these swap contracts were recorded directly to "Interest expense, net."

Foreign Currency Risk

Cash Flow Exposure

We expect certain of our subsidiaries to have future cash flows that will be denominated in currencies other than the subsidiaries' functional currencies. Changes in the exchange rates between the functional currencies of our subsidiaries and the other currencies in which they transact will cause fluctuations in the cash flows we expect to receive or pay when these cash flows are realized or settled. Accordingly, we enter into foreign exchange forward contracts to hedge a portion of these forecasted cash flows. As of December 31, 2021, these foreign exchange forward contracts hedged our forecasted cash flows for periods up to 11 months. These foreign exchange forward contracts qualify for accounting as cash flow hedges in accordance with ASC 815, and we designated them as such. We report unrealized gains or losses on such contracts in "Accumulated other comprehensive loss" and subsequently reclassify applicable amounts into earnings when the hedged transaction occurs and impacts earnings. We determined that these derivative financial instruments were highly effective as cash flow hedges as of December 31, 2021.

As of December 31, 2021, the notional values associated with our foreign exchange forward contracts qualifying as cash flow hedges were as follows (notional amounts and U.S. dollar equivalents in millions):

	December 31, 2021	
Currency	Notional Amount	USD Equivalent
U.S. dollar (1)	$38.4	$38.4
British pound	GBP 10.6	$14.4

(1) These derivative instruments represent hedges of outstanding payables denominated in U.S. dollars at certain of our foreign subsidiaries whose functional currencies are other than the U.S. dollar.

Net Investment Exposure

The functional currencies of certain of our foreign subsidiaries are their local currencies. Accordingly, we apply period-end exchange rates to translate their assets and liabilities and daily transaction exchange rates to translate their revenues, expenses, gains, and losses into U.S. dollars. We include the associated translation adjustments as a separate component of "Accumulated other comprehensive loss" within stockholders' equity. From time to time, we may seek to mitigate the impact of such translation adjustments by entering into foreign exchange forward contracts that are designated as hedges of net investments in certain foreign subsidiaries. In June 2022, we entered into a foreign exchange forward contract with a notional value of ¥8.0 billion ($60.6 million), which qualifies for and was designated as a hedge of our net investment in a certain foreign subsidiary in Japan. As of September 30, 2022, this foreign exchange forward contract hedged such net investment for a remaining period of 3 months. We report unrealized gains or losses on this contract, which are based on spot exchange rates, as a component of our foreign currency translation adjustments within "Accumulated other comprehensive loss" and subsequently reclassify applicable amounts into earnings when the net investments are sold or substantially liquidated. We determined that this derivative financial instrument was highly effective as a net investment hedge as of September 30, 2022.

Transaction Exposure and Economic Hedging

Many of our subsidiaries have assets and liabilities (primarily cash, receivables, deferred taxes, payables, accrued expenses, operating lease liabilities, and solar module collection and recycling liabilities) that are denominated in currencies other than the subsidiaries' functional currencies. Changes in the exchange rates between the functional currencies of our subsidiaries and the other currencies in which these assets and liabilities are denominated will create fluctuations in our reported condensed consolidated statements of operations and cash flows. We may enter into foreign exchange forward contracts or other financial instruments to economically hedge assets and liabilities against the effects of currency exchange rate fluctuations. The gains and losses on such foreign exchange forward contracts will economically offset all or part of the transaction gains and losses that we recognize in earnings on the related foreign currency denominated assets and liabilities.

We also enter into foreign exchange forward contracts to economically hedge balance sheet and other exposures related to transactions between certain of our subsidiaries and transactions with third parties. Such contracts are considered economic hedges and do not qualify for hedge accounting. Accordingly, we recognize gains or losses from the fluctuations in foreign exchange rates and the fair value of these derivative contracts in "Foreign currency loss, net" on our condensed consolidated statements of operations.

As of September 30, 2022 and December 31, 2021, the notional values of our foreign exchange forward contracts that do not qualify for hedge accounting were as follows (notional amounts and U.S. dollar equivalents in millions):

	September 30, 2022		
Transaction	**Currency**	**Notional Amount**	**USD Equivalent**
Sell	Chilean peso	CLP 5,996.5	$6.2
Purchase	Euro	€89.0	$85.7
Sell	Euro	€29.4	$28.3
Sell	Indian rupee	INR 18,611.5	$227.8
Purchase	Japanese yen	¥1,820.9	$12.6
Sell	Japanese yen	¥11,674.4	$80.8
Purchase	Malaysian ringgit	MYR 38.2	$8.3
Sell	Malaysian ringgit	MYR 28.1	$6.1
Sell	Mexican peso	MXN 34.6	$1.7
Purchase	Singapore dollar	SGD 1.4	$1.0

Transaction	December 31, 2021 Currency	Notional Amount	USD Equivalent
Purchase	Australian dollar	AUD 3.2	$2.3
Purchase	Brazilian real	BRL 2.6	$0.5
Sell	Brazilian real	BRL 2.6	$0.5
Purchase	British pound	GBP 2.5	$3.4
Sell	Chilean peso	CLP 4,058.6	$4.8
Purchase	Euro	€77.6	$88.0
Sell	Euro	€38.6	$43.8
Sell	Indian rupee	INR 10,943.0	$147.1
Purchase	Japanese yen	¥667.5	$5.8
Sell	Japanese yen	¥31,524.6	$273.9
Purchase	Malaysian ringgit	MYR 17.0	$4.1
Sell	Malaysian ringgit	MYR 24.5	$5.9
Sell	Mexican peso	MXN 34.6	$1.7
Purchase	Singapore dollar	SGD 5.5	$4.1

Commodity Price Risk

We use commodity swap contracts to mitigate our exposure to commodity price fluctuations for certain raw materials used in the production of our modules. During the nine months ended September 30, 2022, we entered into various commodity swap contracts to hedge a portion of our forecasted cash flows for purchases of aluminum frames between July 2022 and December 2023. Such swaps had an aggregate initial notional value based on metric tons of forecasted aluminum purchases, equivalent to $70.5 million, and entitle us to receive a three-month average London Metals Exchange price for aluminum while requiring us to pay certain fixed prices. The notional amount of the commodity swap contracts proportionately adjusts with forecasted purchases of aluminum frames. As of September 30, 2022, the notional value associated with these contracts were $42.5 million.

These commodity swap contracts qualify for accounting as cash flow hedges in accordance with ASC 815, and we designated them as such. We report unrealized gains or losses on such contracts in “Accumulated other comprehensive loss” and subsequently reclassify applicable amounts into earnings when the hedged transactions occur and impact earnings. We determined that these derivative financial instruments were highly effective as cash flow hedges as of September 30, 2022. In the following 12 months, we expect to reclassify into earnings $7.7 million of net unrealized losses related to these commodity swap contracts that are included in “Accumulated other comprehensive loss” at September 30, 2022 as we realize the earnings effects of the related forecasted transactions. The amount we ultimately record to earnings will depend on the actual commodity pricing when we realize the related forecasted transactions.

7. Leases

Our lease arrangements include land associated with our PV solar power systems, our corporate and administrative offices, land for our international manufacturing facilities, and certain of our manufacturing equipment. Such leases primarily relate to assets located in the United States, Malaysia, India, and Vietnam.

The following table presents certain quantitative information related to our lease arrangements for the three and nine months ended September 30, 2022 and 2021, and as of September 30, 2022 and December 31, 2021 (in thousands):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2022	2021	2022	2021
Operating lease cost	$ 3,034	$ 4,622	$ 11,643	$ 13,171
Variable lease cost	635	575	1,838	1,575
Short-term lease cost	48	104	300	711
Total lease cost	$ 3,717	$ 5,301	$ 13,781	$ 15,457
Payments of amounts included in the measurement of operating lease liabilities			$ 11,867	$ 16,813
Lease assets obtained in exchange for operating lease liabilities			$ 3,992	$ 19,769

	September 30, 2022	December 31, 2021
Operating lease assets	$ 97,861	$ 207,544
Operating lease liabilities – current	8,907	12,781
Operating lease liabilities – noncurrent	44,655	145,912
Weighted-average remaining lease term	7 years	19 years
Weighted-average discount rate	5.0 %	2.8 %

In June 2022, we completed the sale of our Japan project development business to PAG, which included the transfer of various land leases associated with the business. As a result, we derecognized lease assets of $87.7 million, current lease liabilities of $3.0 million, and noncurrent lease liabilities of $77.9 million. See Note 2. "Sales of Businesses" to our condensed consolidated financial statements for further information about this transaction.

As of September 30, 2022, the future payments associated with our lease liabilities were as follows (in thousands):

	Total Lease Liabilities
Remainder of 2022	$ 2,872
2023	11,122
2024	10,708
2025	9,830
2026	8,418
2027	5,923
Thereafter	14,618
Total future payments	63,491
Less: interest	(9,929)
Total lease liabilities	$ 53,562

8. Fair Value Measurements

The following is a description of the valuation techniques that we use to measure the fair value of assets and liabilities that we measure and report at fair value on a recurring basis:

- *Cash equivalents*. At September 30, 2022, our cash equivalents consisted of money market funds. We value our cash equivalents using observable inputs that reflect quoted prices for securities with identical characteristics and classify the valuation techniques that uses these inputs as Level 1.

- *Marketable Securities and Restricted Marketable Securities*. At September 30, 2022 and December 31, 2021, our marketable securities consisted of foreign debt, U.S. debt, and time deposits, and our restricted marketable securities consisted of foreign and U.S. government obligations, supranational debt, and U.S. debt. We value our marketable securities and restricted marketable securities using observable inputs that reflect quoted prices for securities with identical characteristics or quoted prices for securities with similar characteristics and other observable inputs (such as interest rates that are observable at commonly quoted intervals). Accordingly, we classify the valuation techniques that use these inputs as either Level 1 or Level 2 depending on the inputs used. We also consider the effect of our counterparties' credit standing in these fair value measurements.

- *Derivative Assets and Liabilities*. At September 30, 2022 and December 31, 2021, our derivative assets and liabilities consisted of foreign exchange forward contracts involving major currencies. At September 30, 2022, our derivative liabilities also included commodity swap contracts involving major commodity prices. Since our derivative assets and liabilities are not traded on an exchange, we value them using standard industry valuation models. As applicable, these models project future cash flows and discount the amounts to a present value using market-based observable inputs, including credit risk, foreign exchange rates, forward and spot prices for currencies, and forward prices for commodities. These inputs are observable in active markets over the contract term of the derivative instruments we hold, and accordingly, we classify the valuation techniques as Level 2. In evaluating credit risk, we consider the effect of our counterparties' and our own credit standing in the fair value measurements of our derivative assets and liabilities, respectively.

At September 30, 2022 and December 31, 2021, the fair value measurements of our assets and liabilities measured on a recurring basis were as follows (in thousands):

		Fair Value Measurements at Reporting Date Using		
	September 30, 2022	**Quoted Prices in Active Markets for Identical Assets (Level 1)**	**Significant Other Observable Inputs (Level 2)**	**Significant Unobservable Inputs (Level 3)**
Assets:				
Cash equivalents:				
Money market funds	$ 195	$ 195	$ —	$ —
Marketable securities:				
Foreign debt	62,880	—	62,880	—
U.S. debt	56,406	—	56,406	—
Time deposits	656,927	656,927	—	—
Restricted marketable securities	182,208	—	182,208	—
Derivative assets	11,247	—	11,247	—
Total assets	$ 969,863	$ 657,122	$ 312,741	$ —
Liabilities:				
Derivative liabilities	$ 13,732	$ —	$ 13,732	$ —

		Fair Value Measurements at Reporting Date Using		
	December 31, 2021	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Marketable securities:				
Foreign debt	$ 103,317	$ —	$ 103,317	$ —
U.S. debt	18,627	—	18,627	—
Time deposits	253,445	253,445	—	—
Restricted marketable securities	244,726	—	244,726	—
Derivative assets	5,816	—	5,816	—
Total assets	$ 625,931	$ 253,445	$ 372,486	$ —
Liabilities:				
Derivative liabilities	$ 3,550	$ —	$ 3,550	$ —

Fair Value of Financial Instruments

At September 30, 2022 and December 31, 2021, the carrying values and fair values of our financial instruments not measured at fair value were as follows (in thousands):

	September 30, 2022		December 31, 2021	
	Carrying Value	Fair Value	Carrying Value	Fair Value
Assets:				
Accounts receivable unbilled, net - noncurrent	$ 11,488	$ 10,207	$ 20,840	$ 18,846
Accounts receivable trade, net - noncurrent	9,645	7,852	21,293	18,605
Liabilities:				
Long-term debt, including current maturities (1)	$ 266,169	$ 229,673	$ 246,737	$ 243,865

(1) Excludes unamortized discounts and issuance costs.

The carrying values in our condensed consolidated balance sheets of our current trade accounts receivable, current unbilled accounts receivable, restricted cash, accounts payable, and accrued expenses approximated their fair values due to their nature and relatively short maturities; therefore, we excluded them from the foregoing table. The fair value measurements for our noncurrent unbilled accounts receivable, noncurrent trade accounts receivable, and long-term debt are considered Level 2 measurements under the fair value hierarchy.

Credit Risk

We have certain financial and derivative instruments that subject us to credit risk. These consist primarily of cash, marketable securities, accounts receivable, restricted cash, restricted marketable securities, foreign exchange forward contracts, and commodity swap contracts. We are exposed to credit losses in the event of nonperformance by the counterparties to our financial and derivative instruments. We place these instruments with various high-quality financial institutions and limit the amount of credit risk from any one counterparty. We monitor the credit standing of our counterparty financial institutions. Our net sales are primarily concentrated among a limited number of customers. We monitor the financial condition of our customers and perform credit evaluations whenever considered necessary. We typically require some form of payment security from our customers, including, but not limited to, advance payments, parent guarantees, letters of credit, bank guarantees, or surety bonds.

9. Debt

Our long-term debt consisted of the following at September 30, 2022 and December 31, 2021 (in thousands):

Loan Agreement	Currency	Balance (USD) September 30, 2022	Balance (USD) December 31, 2021
Luz del Norte Credit Facilities	USD	$ 181,169	$ 183,829
India Credit Facility	USD	85,000	—
Kyoto Credit Facility	JPY	—	62,908
Long-term debt principal		266,169	246,737
Less: unamortized discounts and issuance costs		(6,510)	(6,836)
Total long-term debt		259,659	239,901
Less: current portion		(5,435)	(3,896)
Noncurrent portion		$ 254,224	$ 236,005

Luz del Norte Credit Facilities

In August 2014, Parque Solar Fotovoltaico Luz del Norte SpA ("Luz del Norte"), our indirect wholly-owned subsidiary and project company, entered into credit facilities (the "Luz del Norte Credit Facilities") with the U.S. International Development Finance Corporation ("DFC") and the International Finance Corporation ("IFC") to provide limited-recourse senior secured debt financing for the design, development, financing, construction, testing, commissioning, operation, and maintenance of a 141 MW_{AC} PV solar power plant located near Copiapó, Chile. As of September 30, 2022 and December 31, 2021, the balance outstanding on the DFC loans was $135.7 million and $137.7 million, respectively. As of September 30, 2022 and December 31, 2021, the balance outstanding on the IFC loans was $45.5 million and $46.1 million, respectively. The DFC and IFC loans mature in June 2037 and are secured by liens over all of Luz del Norte's assets, a pledge of all of the equity interests in the entity, and certain letters of credit.

India Credit Facility

In July 2022, FS India Solar Ventures Private Limited, our indirect wholly-owned subsidiary, entered into a finance agreement (the "India Credit Facility") with DFC for aggregate borrowings up to $500.0 million for the development and construction of an approximately 3.3 GW_{DC} solar module manufacturing facility located in Tamil Nadu, India. Principal on the India Credit Facility is payable in scheduled semi-annual installments through the facility's expected maturity in August 2029. The India Credit Facility is guaranteed by First Solar, Inc.

Kyoto Credit Facility

In July 2020, First Solar Japan GK, our wholly-owned subsidiary, entered into a construction loan facility with Mizuho Bank, Ltd. for borrowings up to ¥15.0 billion ($142.8 million), which are intended to be used for the construction of a 38 MW_{AC} PV solar power plant located in Kyoto, Japan (the "Kyoto Credit Facility"). In May 2022, we repaid the remaining $73.2 million principal balance on the credit facility.

Momura Credit Facility

In May 2022, FS Japan Project 25 GK (“Momura”), our indirect wholly-owned subsidiary and project company, entered into a credit agreement (the “Momura Credit Facility”) with Nomura Capital Investment Co., Ltd. and Aozora Bank, Ltd. for aggregate borrowings up to ¥21.5 billion ($168.1 million) for the development and construction of a 53 MW_{AC} PV solar power plant located in Tochigi, Japan. The credit facility consisted of an ¥18.8 billion ($146.6 million) term loan facility, a ¥1.9 billion ($15.1 million) consumption tax facility, and a ¥0.8 billion ($6.4 million) debt service reserve facility. In June 2022, we completed the sale of our Japan project development business, and the credit facility’s outstanding balance of $107.2 million was assumed by PAG. See Note 2. “Sales of Businesses” to our condensed consolidated financial statements for further information about this transaction.

Yatsubo Credit Facility

In May 2022, FS Japan Project 24 GK (“Yatsubo”), our indirect wholly-owned subsidiary and project company, entered into a credit agreement (the “Yatsubo Credit Facility”) with Nomura Capital Investment Co., Ltd. and Aozora Bank, Ltd. for aggregate borrowings up to ¥10.9 billion ($85.0 million) for the development and construction of a 26 MW_{AC} PV solar power plant located in Tochigi, Japan. The credit agreement consisted of a ¥9.5 billion ($74.2 million) term loan facility, a ¥1.0 billion ($7.6 million) consumption tax facility, and a ¥0.4 billion ($3.2 million) debt service reserve facility. In June 2022, we completed the sale of our Japan project development business, and the credit facility’s outstanding balance of $70.0 million was assumed by PAG. See Note 2. “Sales of Businesses” to our condensed consolidated financial statements for further information about this transaction.

Orido Credit Facility

In May 2022, FS Japan Project B5 GK (“Orido”), our indirect wholly-owned subsidiary and project company, entered into a credit agreement (the “Orido Credit Facility”) with Nomura Capital Investment Co., Ltd. and Aozora Bank, Ltd. for aggregate borrowings up to ¥5.3 billion ($41.3 million) for the development and construction of a 14 MW_{AC} PV solar power plant located in Tochigi, Japan. The credit agreement consisted of a ¥4.6 billion ($36.0 million) term loan facility, a ¥0.5 billion ($3.6 million) consumption tax facility, and a ¥0.2 billion ($1.7 million) debt service reserve facility. In June 2022, we completed the sale of our Japan project development business, and the credit facility’s outstanding balance of $18.0 million was assumed by PAG. See Note 2. “Sales of Businesses” to our condensed consolidated financial statements for further information about this transaction.

Variable Interest Rate Risk

Certain of our long-term debt agreements bear interest at London Interbank Offered Rate (“LIBOR”) or equivalent variable rates. An increase in these variable rates would increase the cost of borrowing under the debt agreements. Our long-term debt borrowing rates as of September 30, 2022 were as follows:

Loan Agreement	September 30, 2022
Luz del Norte Credit Facilities (1)	Fixed rate loans at bank rate plus 3.50% Variable rate loans at 91-Day U.S. Treasury Bill Yield or LIBOR plus 3.50%
India Credit Facility	U.S. Treasury Constant Maturity Yield plus 1.75%

(1) Outstanding balance comprised of $122.4 million of fixed rate loans and $58.8 million of variable rate loans as of September 30, 2022.

Future Principal Payments

At September 30, 2022, the future principal payments on our long-term debt were due as follows (in thousands):

	Total Debt
Remainder of 2022	$ 1,375
2023	6,085
2024	13,047
2025	23,013
2026	23,418
2027	24,661
Thereafter	174,570
Total long-term debt future principal payments	$ 266,169

10. Commitments and Contingencies

Commercial Commitments

During the normal course of business, we enter into commercial commitments in the form of letters of credit and surety bonds to provide financial and performance assurance to third parties. As of September 30, 2022, the majority of these commercial commitments supported our modules business. As of September 30, 2022, the issued and outstanding amounts and available capacities under these commitments were as follows (in millions):

	Issued and Outstanding	Available Capacity
Bilateral facilities (1)	$ 95.8	$ 119.2
Surety bonds	8.8	232.8

(1) Of the total letters of credit issued under the bilateral facilities, $2.3 million was secured with cash.

Product Warranties

When we recognize revenue for sales of modules or projects, we accrue liabilities for the estimated future costs of meeting our limited warranty obligations for both modules and the balance of the systems. We estimate our limited product warranty liability for power output and defects in materials and workmanship under normal use and service conditions based on return rates for each series of module technology. We make and revise these estimates based primarily on the number of solar modules under warranty installed at customer locations, our historical experience with and projections of warranty claims, and our estimated per-module replacement costs. We also monitor our expected future module performance through certain quality and reliability testing and actual performance in certain field installation sites. From time to time, we have taken remediation actions with respect to affected modules beyond our limited warranties and may elect to do so in the future, in which case we would incur additional expenses. Such potential voluntary future remediation actions beyond our limited warranty obligations may be material to our condensed consolidated statements of operations if we commit to any such remediation actions.

Product warranty activities during the three and nine months ended September 30, 2022 and 2021 were as follows (in thousands):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2022	2021	2022	2021
Product warranty liability, beginning of period	$ 47,129	$ 91,058	$ 52,553	$ 95,096
Accruals for new warranties issued	1,376	1,680	3,649	8,397
Settlements	(3,160)	(1,091)	(10,414)	(6,730)
Changes in estimate of product warranty liability	(10,360)	(33,106)	(10,803)	(38,222)
Product warranty liability, end of period	$ 34,985	$ 58,541	$ 34,985	$ 58,541
Current portion of warranty liability	$ 11,039	$ 16,752	$ 11,039	$ 16,752
Noncurrent portion of warranty liability	$ 23,946	$ 41,789	$ 23,946	$ 41,789

We estimate our limited product warranty liability for power output and defects in materials and workmanship under normal use and service conditions based on return rates for each series of module technology. During the three months ended September 30, 2022 and 2021, we revised this estimate based on updated information regarding our warranty claims, which reduced our product warranty liability by $10.2 million and $33.1 million, respectively. This updated information reflected lower-than-expected warranty claims for our older series of module technology as well as the evolving claims profile of our newest series of module technology, resulting in reductions to our projected module return rates.

Indemnifications

In certain limited circumstances, we have provided indemnifications to customers or other parties, including project tax equity investors, under which we are contractually obligated to compensate such parties for losses they suffer resulting from a breach of a representation, warranty, or covenant; a reduction in tax benefits received, including investment tax credits; the resolution of specific matters associated with a project’s development or construction; or guarantees of a third party’s payment or performance obligations. Project related tax benefits are, in part, based on guidance provided by the Internal Revenue Service and U.S. Treasury Department, which includes assumptions regarding the fair value of qualifying PV solar power systems. For contracts that have such indemnification provisions, we initially recognize a liability under ASC 460 for the estimated premium that would be required by a guarantor to issue the same indemnity in a standalone arm’s-length transaction with an unrelated party. We may base these estimates on the cost of insurance or other instruments that cover the underlying risks being indemnified and may purchase such instruments to mitigate our exposure to potential indemnification payments. We subsequently measure such liabilities at the greater of the initially estimated premium or the contingent liability required to be recognized under ASC 450. We recognize any indemnification liabilities as a reduction of earnings associated with the related transaction.

After an indemnification liability is recorded, we derecognize such amount pursuant to ASC 460 depending on the nature of the indemnity, which derecognition typically occurs upon expiration or settlement of the arrangement, and any contingent aspects of the indemnity are accounted for in accordance with ASC 450. As of September 30, 2022 and December 31, 2021, we accrued $3.7 million and $3.8 million of current indemnification liabilities, respectively. As of September 30, 2022, the maximum potential amount of future payments under our indemnifications was $102.3 million, and we held insurance and other instruments allowing us to recover up to $28.2 million of potential amounts paid under the indemnifications.

In September 2017, we made an indemnification payment in connection with the sale of one of our projects following the underpayment of anticipated cash grants by the United States government. In February 2018, the associated project entity commenced legal action against the United States government seeking full payment of the cash grants. In May 2021, the parties reached an agreement, pursuant to which the United States government made a settlement payment to the project entity. Under the terms of the indemnification arrangement, we received $65.1 million for our portion of the settlement payment, which we recorded as revenue during the nine months ended September 30, 2021.

Solar Module Collection and Recycling Liability

We previously established a module collection and recycling program, which has since been discontinued, to collect and recycle modules sold and covered under such program once the modules reach the end of their service lives. For legacy customer sales contracts that were covered under this program, we agreed to pay the costs for the collection and recycling of qualifying solar modules, and the end-users agreed to notify us, disassemble their solar power systems, package the solar modules for shipment, and revert ownership rights over the modules back to us at the end of the modules' service lives. Accordingly, we recorded any collection and recycling obligations within "Cost of sales" at the time of sale based on the estimated cost to collect and recycle the covered solar modules.

We estimate the cost of our collection and recycling obligations based on the present value of the expected future cost of collecting and recycling the solar modules, which includes estimates for the cost of packaging materials; the cost of freight from the solar module installation sites to a recycling center; material, labor, and capital costs; and by-product credits for certain materials recovered during the recycling process. We base these estimates on our experience collecting and recycling solar modules and certain assumptions regarding costs at the time the solar modules will be collected and recycled. In the periods between the time of sale and the related settlement of the collection and recycling obligation, we accrete the carrying amount of the associated liability and classify the corresponding expense within "Selling, general and administrative" expense on our condensed consolidated statements of operations.

We periodically review our estimates of expected future recycling costs and may adjust our liability accordingly. During the three months ended September 30, 2022, we completed our annual cost study of obligations under our module collection and recycling program and reduced the associated liability by $7.5 million primarily due to lower estimated capital and chemical costs resulting from improvements to our module recycling technology. During the three months ended September 30, 2021, we completed our annual cost study of obligations under our module collection and recycling program and increased the associated liability by $10.8 million primarily due to lower estimated by-product credits for certain semiconductor materials recovered during the recycling process and updates to certain valuation assumptions.

Our module collection and recycling liability was $120.2 million and $139.1 million as of September 30, 2022 and December 31, 2021, respectively. See Note 4. "Restricted Marketable Securities" to our condensed consolidated financial statements for more information about our arrangements for funding this liability.

Legal Proceedings

Class Action

On January 7, 2022, a putative class action lawsuit titled City of Pontiac General Employees' Retirement System v. First Solar, Inc., et al., Case No. 2:22-cv-00036-MTL, was filed in the United States District Court for the District of Arizona (hereafter "Arizona District Court") against the Company and certain of our current officers (collectively, "Putative Class Action Defendants"). The complaint was filed on behalf of a purported class consisting of all purchasers of First Solar common stock between February 22, 2019 and February 20, 2020, inclusive. The complaint asserts violations of Sections 10(b) and 20(a) of the Securities Exchange Act of 1934 and Rule 10b-5 based on allegedly false and misleading statements related to the Company's Series 6 solar modules and its project development business. It seeks unspecified damages and an award of costs and expenses. The Company and its officers believe they have meritorious defenses and intend to vigorously defend this action. On April 25, 2022, the Arizona District Court issued an order appointing the Palm Harbor Special Fire Control & Rescue District Firefighters' Pension Plan and the Greater Pennsylvania Carpenters' Pension Fund as Lead Plaintiffs. On June 23, 2022, Lead Plaintiffs filed an Amended Complaint that brings the same claims and seeks the same relief as the original complaint. Putative Class Action Defendants filed a motion to dismiss on August 22, 2022. Plaintiffs filed their opposition to the motion to dismiss on October 21, 2022. Given the early stage of the litigation, at this time we are not in a position to assess the likelihood of any potential loss or adverse effect on our financial condition or to estimate the amount or range of potential loss, if any, from this action.

Derivative Action

On September 13, 2022, a derivative action titled Federman v. Widmar, et al., Case No. 2:22-cv-01541-MTM, was filed by a putative stockholder purportedly on behalf of the Company in the Arizona District Court against certain current directors and officers of the Company (collectively, "Derivative Action Defendants"), alleging violations of Section 14(a) of the Securities Exchange Act of 1934, breach of fiduciary duties, contribution and indemnification, aiding and abetting, and gross mismanagement. The complaint generally alleges that the Derivative Action Defendants caused or allowed false and misleading statements to be made concerning the Company's Series 6 modules and project development business. The action includes claims for, among other things, damages in favor of the Company and an award of costs and expenses to the putative plaintiff stockholder, including attorneys' fees. The Company believes that the plaintiff in the derivative action lacks standing to pursue litigation on behalf of First Solar. The derivative action is still in the initial stages and there has been no discovery. Accordingly, we are not in a position to assess the likelihood of any loss or adverse effect on our financial condition or to estimate the amount or range of potential loss, if any, from this action.

Other Matters and Claims

On July 12, 2021, Southern Power Company and certain of its affiliates ("Southern") filed an arbitration demand with the American Arbitration Association against two subsidiaries of the Company, alleging breach of the engineering, procurement, and construction ("EPC") agreements for five projects in the United States, for which the Company's subsidiaries served as EPC contractor. The arbitration demand asserts breach of obligations to design and engineer the projects in accordance with the EPC agreements, particularly as such obligations relate to the procurement of tracker systems and inverters. In September 2022, the Company received additional details in the discovery process of the arbitration, based upon which we believe Southern is seeking damages of approximately $55 million and an award of costs and expenses. Prior to September 2022, no such damages were specified by Southern. The Company and its subsidiaries deny the claims and intend to vigorously defend this arbitration in all respects. Arbitration hearings are scheduled for early 2023. Given the stage of proceedings and inherent risks involved in arbitration, at this time we are unable to assess the likelihood of any potential loss or adverse effect on our financial condition or to estimate the amount or range of potential loss, if any, from this arbitration.

During the three months ended September 30, 2022, we received various indemnification demands from certain customers, for whom we provided EPC services, regarding claims that such customers' PV tracker systems infringe, in part, on patents owned by Trabant Solar, Inc. We have conducted due diligence on the patents and claims and believe that we will prevail, to the extent we are obligated to defend any matter or commence an Inter Partes Review before the United States Patent and Trademark Office.

We are party to other legal matters and claims in the normal course of our operations. While we believe the ultimate outcome of these matters and claims will not have a material adverse effect on our financial position, results of operations, or cash flows, the outcome of such matters and claims is not determinable with certainty, and negative outcomes may adversely affect us. There have been no material changes to these matters since our Annual Report on Form 10-K for the year ended December 31, 2021 was filed with the SEC on March 1, 2022.

11. Revenue from Contracts with Customers

The following table presents the disaggregation of revenue from contracts with customers for the three and nine months ended September 30, 2022 and 2021 along with the reportable segment for each category (in thousands):

		Three Months Ended September 30,		Nine Months Ended September 30,	
Category	**Segment**	**2022**	**2021**	**2022**	**2021**
Solar modules	Modules	$ 619,922	$ 562,810	$ 1,582,248	$ 1,640,436
Energy generation	Other	5,440	7,339	20,689	29,375
O&M services	Other	3,481	5,262	11,558	37,210
Solar power systems	Other	90	10,132	2,433	311,076
EPC services	Other	—	(2,039)	—	(2,039)
Net sales		$ 628,933	$ 583,504	$ 1,616,928	$ 2,016,058

We recognize revenue for module sales at a point in time following the transfer of control of the modules to the customer, which typically occurs upon shipment or delivery depending on the terms of the underlying contracts. Such contracts may contain provisions that require us to make liquidated damage payments to the customer if we fail to ship or deliver modules by scheduled dates. We recognize these liquidated damages as a reduction of revenue in the period we transfer control of the modules to the customer.

We recognize revenue for sales of development projects or completed systems when we enter into the associated sales contract. For certain prior project sales, including sales of solar power systems with EPC services, such revenue included estimated amounts of variable consideration. These estimates may require significant judgment to determine the most likely amount of net contract revenues. The cumulative effect of revisions to estimates is recorded in the period in which the revisions are identified and the amounts can be reasonably estimated. During the three and nine months ended September 30, 2021, respectively, revenue increased $7.8 million and $73.0 million due to net changes in transaction prices for certain projects we previously sold, which represented 0.9% and 2.3% of the aggregate revenue for such projects. Changes for the nine months ended September 30, 2021 were primarily due to a $65.1 million settlement for an outstanding indemnification arrangement associated with the prior sale of one of our projects, which we recorded as revenue during that period. See Note 10. “Commitments and Contingencies” to our condensed consolidated financial statements for discussion of our indemnification arrangements.

The following table reflects the changes in our contract assets, which we classify as “Accounts receivable unbilled, net” and our contract liabilities, which we classify as “Deferred revenue,” for the nine months ended September 30, 2022 (in thousands):

	September 30, 2022	December 31, 2021	Nine Month Change	
Accounts receivable unbilled, net (1)	$ 46,637	$ 46,113	$ 524	1 %
Deferred revenue (2)	$ 584,233	$ 297,811	$ 286,422	96 %

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(1) Includes $11.5 million and $20.8 million of noncurrent accounts receivable unbilled, net classified as “Other assets” on our condensed consolidated balance sheets as of September 30, 2022 and December 31, 2021, respectively.

(2) Includes $348.9 million and $95.9 million of noncurrent deferred revenue classified as “Other liabilities” on our condensed consolidated balance sheets as of September 30, 2022 and December 31, 2021, respectively.

During the nine months ended September 30, 2022, our contract liabilities increased by $286.4 million primarily due to advance payments received for sales of solar modules in the current period, partially offset by the recognition of revenue for sales of solar modules for which payment was received in 2021. During the nine months ended September 30, 2022 and 2021, we recognized revenue of $186.2 million and $169.5 million, respectively, that was included in the corresponding contract liability balance at the beginning of the periods.

As of September 30, 2022, we had entered into contracts with customers for the future sale of 50.0 GW_{DC} of solar modules for an aggregate transaction price of $14.0 billion, which we expect to recognize as revenue through 2027 as we transfer control of the modules to the customers. Such aggregate transaction price excludes estimates of variable consideration for certain contracts with customers that are associated with future module technology improvements, including new product designs and enhancements to certain energy related attributes. Certain other potential price adjustments associated with the extension of the U.S. investment tax credit (“ITC”), sales freight, and changes to certain commodity prices have also been excluded. While our contracts with customers typically represent firm purchase commitments, these contracts may be subject to amendments made by us or requested by our customers. These amendments may increase or decrease the volume of modules to be sold under the contract, change delivery schedules, or otherwise adjust the expected revenue under these contracts.

12. Share-Based Compensation

The following table presents share-based compensation expense recognized in our condensed consolidated statements of operations for the three and nine months ended September 30, 2022 and 2021 (in thousands):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2022	2021	2022	2021
Cost of sales (1)	$ 1,044	$ 154	$ 1,988	$ 235
Selling, general and administrative (1)	9,572	5,746	16,900	14,998
Research and development (2)	1,227	529	2,219	(259)
Production start-up	11	—	14	—
Total share-based compensation expense	$ 11,854	$ 6,429	$ 21,121	$ 14,974

(1) On March 31, 2021, we completed the sales of our North American O&M operations and U.S. project development business, which resulted in the forfeiture of unvested shares for associates (our term for full- and part-time employees) departing the Company as part of the transactions. See Note 2. “Sales of Businesses” to our condensed consolidated financial statements for further information related to these transactions.

(2) Effective March 15, 2021, our former Chief Technology Officer retired from the Company, which resulted in the forfeiture of his unvested shares during the nine months ended September 30, 2021.

Share-based compensation expense capitalized in inventory and PV solar power systems was $0.6 million and $0.7 million as of September 30, 2022 and December 31, 2021, respectively. As of September 30, 2022, we had $43.4 million of unrecognized share-based compensation expense related to unvested restricted stock and performance units, which we expect to recognize over a weighted-average period of approximately 1.4 years.

In July 2019, the compensation committee of our board of directors approved grants of performance units for key executive officers to be earned over a multi-year performance period, which ended in December 2021. Vesting of the 2019 grants of performance units was contingent upon the relative attainment of target cost per watt, module wattage, gross profit, and operating income metrics. In March 2022, the compensation committee certified the achievement of the vesting conditions applicable to the grants, which approximated the maximum level of performance. Accordingly, each participant received one share of common stock for each vested performance unit granted, net of any tax withholdings.

In March 2020, the compensation committee approved additional grants of performance units for key executive officers. Such grants are expected to be earned over a multi-year performance period ending in December 2022. Vesting of the 2020 grants of performance units is contingent upon the relative attainment of target contracted revenue, module wattage, and return on capital metrics.

In May 2021, the compensation committee approved additional grants of performance units for key executive officers. Such grants are expected to be earned over a multi-year performance period ending in December 2023. Vesting of the 2021 grants of performance units is contingent upon the relative attainment of target contracted revenue, cost per watt, incremental average selling price, and operating income metrics.

In March 2022, the compensation committee approved additional grants of performance units for key executive officers. Such grants are expected to be earned over a multi-year performance period ending in December 2024. Vesting of the 2022 grants of performance units is contingent upon the relative attainment of target contracted revenue, cost per watt, and return on capital metrics.

Vesting of performance units is also contingent upon the employment of program participants through the applicable vesting dates, with limited exceptions in case of death, disability, a qualifying retirement, or a change-in-control of First Solar. Outstanding performance units are included in the computation of diluted net income per share based on the number of shares that would be issuable if the end of the reporting period were the end of the contingency period.

In February 2022, First Solar adopted a Clawback Policy ("the Policy") that applies to the Company's current and former Section 16 officers. The Policy applies to all incentive compensation, including any performance-based annual incentive awards and performance-based equity compensation. The Policy was adopted to ensure that incentive compensation is paid or awarded based on accurate financial results and the correct calculation of performance against incentive targets.

13. Income Taxes

In August 2022, the U.S. President signed into law the Inflation Reduction Act of 2022 (the "IRA"), which revised U.S. tax law by, among other things, including a new corporate alternative minimum tax (the "CAMT") of 15% on certain large corporations, imposing a 1% excise tax on stock buybacks, and providing incentives to address climate change, including the introduction of advanced manufacturing production tax credits. The provisions of the IRA are generally effective for tax years beginning after 2022. Given the complexities of the IRA, which is pending technical guidance and regulations from the Internal Revenue Service and U.S. Treasury Department, we will continue to monitor these developments and evaluate the potential future impact to our results of operations.

Our effective tax rate was 341.4% and 16.7% for the nine months ended September 30, 2022 and 2021, respectively. The increase in our effective tax rate was primarily driven by the relative size of our pretax income in the current period, higher losses in certain jurisdictions for which no tax benefit could be recorded, the remeasurement of our net deferred tax assets in Vietnam as a result of the new long-term tax incentive described below, lower relative amounts of income earned in foreign jurisdictions with lower tax rates, and the effect of tax law changes associated with the foreign tax credit ("FTC") regulations described below. Our provision for income taxes differed from the amount computed by applying the U.S. statutory federal income tax rate of 21% primarily due to higher losses in certain jurisdictions for which no tax benefit could be recorded, the remeasurement of our net deferred tax assets in Vietnam mentioned above, and the effect of the FTC regulations described below.

In December 2021, the U.S. Treasury released final FTC regulations addressing various aspects of the U.S. FTC regime. Among other items, these regulations revised the definition of a creditable foreign income tax and the time at which foreign taxes accrued can be claimed as a credit. These regulations are applicable for tax years beginning on or after December 28, 2021. As a result of these regulations, foreign taxes, which were previously creditable, are now treated as foreign tax deductions at the U.S. statutory federal income tax rate of 21%.

Our Malaysian subsidiary has been granted a long-term tax holiday that expires in 2027. The tax holiday, which generally provides for a full exemption from Malaysian income tax, is conditional upon our continued compliance with certain employment and investment thresholds, which we are currently in compliance with and expect to continue to comply with through the expiration of the tax holiday in 2027.

Our Vietnamese subsidiary had previously been granted a tax incentive that provided a two-year tax exemption, which began in 2020, and reduced annual tax rates through the end of 2025. In May 2022, our Vietnamese subsidiary was granted a new long-term tax incentive that provides an additional two-year tax exemption and reduced annual tax rates through 2036, conditional upon our continued compliance with certain revenue and research and development ("R&D") spending thresholds, which we are currently in compliance with and expect to continue to comply with through the expiration of the tax holiday.

We account for uncertain tax positions pursuant to the recognition and measurement criteria under ASC 740. It is reasonably possible that $0.3 million of uncertain tax positions will be recognized within the next 12 months due to the expiration of the statute of limitations associated with such positions.

We are subject to audit by federal, state, local, and foreign tax authorities. We are currently under examination in India, Chile, Singapore, and the state of California. We believe that adequate provisions have been made for any adjustments that may result from tax examinations. However, the outcome of tax examinations cannot be predicted with certainty. If any issues addressed by our tax examinations are not resolved in a manner consistent with our expectations, we could be required to adjust our provision for income taxes in the period such resolution occurs.

14. Net (Loss) Income per Share

The calculation of basic and diluted net (loss) income per share for the three and nine months ended September 30, 2022 and 2021 was as follows (in thousands, except per share amounts):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2022	2021	2022	2021
Basic net (loss) income per share				
Numerator:				
Net (loss) income	$ (49,168)	$ 45,203	$ (36,618)	$ 337,323
Denominator:				
Weighted-average common shares outstanding	106,596	106,320	106,532	106,241
Diluted net (loss) income per share				
Denominator:				
Weighted-average common shares outstanding	106,596	106,320	106,532	106,241
Effect of restricted stock and performance units	—	579	—	638
Weighted-average shares used in computing diluted net (loss) income per share	106,596	106,899	106,532	106,879
Net (loss) income per share:				
Basic	$ (0.46)	$ 0.43	$ (0.34)	$ 3.18
Diluted	$ (0.46)	$ 0.42	$ (0.34)	$ 3.16

The following table summarizes the potential shares of common stock that were excluded from the computation of diluted net (loss) income per share for the three and nine months ended September 30, 2022 and 2021 as such shares would have had an anti-dilutive effect (in thousands):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2022	2021	2022	2021
Anti-dilutive shares	626	8	523	3

15. Accumulated Other Comprehensive Loss

The following table presents the changes in accumulated other comprehensive loss, net of tax, for the nine months ended September 30, 2022 (in thousands):

	Foreign Currency Translation Adjustment	Unrealized Gain (Loss) on Marketable Securities and Restricted Marketable Securities	Unrealized Gain (Loss) on Derivative Instruments	Total
Balance as of December 31, 2021	$ (89,452)	$ (8,036)	$ 1,126	$ (96,362)
Other comprehensive loss before reclassifications	(36,386)	(55,996)	(10,287)	(102,669)
Amounts reclassified from accumulated other comprehensive loss	(4,312)	—	(1,671)	(5,983)
Net tax effect	—	2,624	2,540	5,164
Net other comprehensive loss	(40,698)	(53,372)	(9,418)	(103,488)
Balance as of September 30, 2022	$ (130,150)	$ (61,408)	$ (8,292)	$ (199,850)

The following table presents the pretax amounts reclassified from accumulated other comprehensive loss into our condensed consolidated statements of operations for the three and nine months ended September 30, 2022 and 2021 (in thousands):

		Three Months Ended September 30,		Nine Months Ended September 30,	
Comprehensive Income Components	Income Statement Line Item	2022	2021	2022	2021
Foreign currency translation adjustment:					
Foreign currency translation adjustment	Gain on sales of businesses, net	$ —	$ —	$ 3,756	$ —
Foreign currency translation adjustment	Other income (expense), net	403	(728)	556	(1,203)
Total foreign currency translation adjustment		403	(728)	4,312	(1,203)
Unrealized gain on marketable securities and restricted marketable securities	Other income (expense), net	—	—	—	11,696
Unrealized gain (loss) on derivative instruments:					
Foreign exchange forward contracts	Cost of sales	218	15	1,671	(1,913)
Commodity swap contracts	Cost of sales	—	670	—	883
Total unrealized gain (loss) on derivative instruments		218	685	1,671	(1,030)
Total gain (loss) reclassified		$ 621	$ (43)	$ 5,983	$ 9,463

16. Segment Reporting

Our primary segment is our modules business, which involves the design, manufacture, and sale of cadmium telluride ("CdTe") solar modules, which convert sunlight into electricity. Third-party customers of our modules segment include developers and operators of PV solar power systems. Our residual business operations include the results of operations from PV solar power systems we own and operate in certain international regions, as well as certain O&M services and project development activities.

For the year ended December 31, 2021, we changed our reportable segments to align with revisions to our internal reporting structure and long-term strategic plans. Following this change, our modules business represents our only reportable segment. We previously operated our business in two segments, which included our modules and systems businesses. Systems business activities primarily involved (i) project development, (ii) EPC services, and (iii) O&M services, which now comprise our residual business operations and are categorized as "Other" in the tables below. All prior year balances were revised to conform to the current year presentation.

See Note 20. "Segment and Geographical Information" in our Annual Report on Form 10-K for the year ended December 31, 2021 for additional discussion of our segment reporting.

The following tables provide a reconciliation of certain financial information for our reportable segment to information presented in our condensed consolidated financial statements for the three and nine months ended September 30, 2022 and 2021 and as of September 30, 2022 and December 31, 2021 (in thousands):

	Three Months Ended September 30, 2022			Three Months Ended September 30, 2021		
	Modules	Other	Total	Modules	Other	Total
Net sales	$ 619,922	$ 9,011	$ 628,933	$ 562,810	$ 20,694	$ 583,504
Gross profit (loss)	24,040	(3,058)	20,982	118,260	6,320	124,580
Depreciation and amortization expense	58,287	2,075	60,362	56,335	3,045	59,380

	Nine Months Ended September 30, 2022			Nine Months Ended September 30, 2021		
	Modules	Other	Total	Modules	Other	Total
Net sales	$ 1,582,248	$ 34,680	$ 1,616,928	$ 1,640,436	$ 375,622	$ 2,016,058
Gross profit (loss)	66,396	(57,151)	9,245	328,047	155,418	483,465
Depreciation and amortization expense	172,296	7,276	179,572	163,747	9,193	172,940

	September 30, 2022			December 31, 2021		
	Modules	Other	Total	Modules	Other	Total
Goodwill	$ 14,462	$ —	$ 14,462	$ 14,462	$ —	$ 14,462

Item 2. ***Management's Discussion and Analysis of Financial Condition and Results of Operations***

Cautionary Statement Regarding Forward-Looking Statements

This Quarterly Report on Form 10-Q contains forward-looking statements within the meaning of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and the Securities Act of 1933, as amended (the "Securities Act"), which are subject to risks, uncertainties, and assumptions that are difficult to predict. All statements in this Quarterly Report on Form 10-Q, other than statements of historical fact, are forward-looking statements. These forward-looking statements are made pursuant to safe harbor provisions of the Private Securities Litigation Reform Act of 1995. The forward-looking statements include statements, among other things, concerning: the length and severity of the ongoing COVID-19 (novel coronavirus) outbreak, including its impacts across our businesses on demand, manufacturing operations, construction activities associated with our expanding manufacturing capacity, financing, and our global supply chains, actions that may be taken by governmental authorities to contain the COVID-19 outbreak or to treat its impacts, and the ability of our customers, suppliers, equipment vendors, and other counterparties to fulfill their contractual obligations to us; effects resulting from certain module manufacturing changes; our business strategy, including anticipated trends and developments in and management plans for our business and the markets in which we operate; future financial results, operating results, revenues, gross margin, operating expenses, products, projected costs (including estimated future module collection and recycling costs), warranties, solar module technology and cost reduction roadmaps, restructuring, product reliability, investments, and capital expenditures; our ability to continue to reduce the cost per watt of our solar modules; the impact of public policies, such as tariffs or other trade remedies imposed on solar cells and modules; the potential impact of legislation intended to encourage renewable energy investments through tax credits; effects resulting from pending litigation; our ability to expand manufacturing capacity worldwide; the impact of supply chain disruptions, further exacerbated by the COVID-19 pandemic, that may affect the procurement of raw materials used in our manufacturing process and the distribution of our modules; research and development ("R&D") programs and our ability to improve the wattage of our solar modules; sales and marketing initiatives; and competition. In some cases, you can identify these statements by forward-looking words, such as "estimate," "expect," "anticipate," "project," "plan," "intend," "seek," "believe," "forecast," "foresee," "likely," "may," "should," "goal," "target," "might," "will," "could," "predict," "continue," "contingent," and the negative or plural of these words, and other comparable terminology.

Forward-looking statements are only predictions based on our current expectations and our projections about future events. All forward-looking statements included in this Quarterly Report on Form 10-Q are based upon information available to us as of the filing date of this Quarterly Report on Form 10-Q and therefore speak only as of the filing date. You should not place undue reliance on these forward-looking statements. We undertake no obligation to update any of these forward-looking statements for any reason, whether as a result of new information, future developments, or otherwise. These forward-looking statements involve known and unknown risks, uncertainties, and other factors that may cause our actual results, levels of activity, performance, or achievements to differ materially from those expressed or implied by these statements. These factors include, but are not limited to, the severity and duration of the COVID-19 pandemic, including its potential impact on the Company's business, financial condition, and results of operations; structural imbalances in global supply and demand for PV solar modules; the market for renewable energy, including solar energy; our competitive position and other key competitive factors; reduction, elimination, or expiration of government subsidies, policies, and support programs for solar energy projects; the impact of public policies, such as tariffs or other trade remedies imposed on solar cells and modules; the passage of legislation intended to encourage renewable energy investments through tax credits; our ability to execute on our long-term strategic plans; our ability to execute on our solar module technology and cost reduction roadmaps; our ability to produce bifacial solar modules and next generation Series 7 modules; our ability to improve the wattage of our solar modules; interest rate fluctuations and our customers' ability to secure financing; the loss of any of our large customers, or the ability of our customers and counterparties to perform under their contracts with us; the satisfaction of conditions precedent in our sales agreements; our ability to attract new customers and to develop and maintain existing customer and supplier relationships; our ability to convert existing or construct production facilities to support new product lines; general economic and business conditions, including those influenced by

U.S., international, and geopolitical events; environmental responsibility, including with respect to CdTe and other semiconductor materials; claims under our limited warranty obligations; changes in, or the failure to comply with, government regulations and environmental, health, and safety requirements; effects resulting from pending litigation; future collection and recycling costs for solar modules covered by our module collection and recycling program; supply chain disruption, including the availability of shipping containers, port congestion, cancelled shipments by logistic providers, and the cost of fuel, demurrage, and detention charges, all of which may be exacerbated by the COVID-19 pandemic; our ability to protect our intellectual property; our ability to prevent and/or minimize the impact of cyber-attacks or other breaches of our information systems; our continued investment in research and development ("R&D"); the supply and price of components and raw materials, including CdTe; our ability to attract and retain key executive officers and associates; and the matters discussed in Item 1A. "Risk Factors" of our Annual Report on Form 10-K for the year ended December 31, 2021, elsewhere in this Quarterly Report on Form 10-Q, and our other reports filed with the SEC. You should carefully consider the risks and uncertainties described in these reports.

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our condensed consolidated financial statements and the related notes thereto included in this Quarterly Report on Form 10-Q. When referring to our manufacturing capacity, total sales, and solar module sales, the unit of electricity in watts for megawatts ("MW") and gigawatts ("GW") is direct current ("DC" or "$_{DC}$") unless otherwise noted. When referring to our projects or systems, the unit of electricity in watts for MW and GW is alternating current ("AC" or "$_{AC}$") unless otherwise noted.

Executive Overview

We are a leading American solar technology company and global provider of PV solar energy solutions. Developed at our R&D labs in California and Ohio, we manufacture and sell PV solar modules with an advanced thin film semiconductor technology that provide a high-performance, lower-carbon alternative to conventional crystalline silicon PV solar modules. From raw material sourcing through end-of-life module recycling, we are committed to reducing the environmental impacts and enhancing the social and economic benefits of our products across their life cycle. We are the world's largest thin film PV solar module manufacturer and the largest PV solar module manufacturer in the Western Hemisphere.

Certain of our financial results and other key operational developments for the three months ended September 30, 2022 include the following:

- Net sales for the three months ended September 30, 2022 increased by 8% to $628.9 million compared to $583.5 million for the same period in 2021. The increase was primarily driven by an increase in the volume of modules sold to third parties, partially offset by a decrease in the average selling price per watt.

- Gross profit for the three months ended September 30, 2022 decreased 18.1 percentage points to 3.3% from 21.4% for the same period in 2021. The decrease in gross profit was primarily due to a decrease in the average selling price per watt of our modules, an increase in sales freight, demurrage, and detention charges, a lower benefit from reductions to our product warranty liability, and a favorable settlement with a customer in the prior period. These decreases to gross profit were partially offset by the higher volume of modules sold, a decrease to our module collection and recycling liability in the current period compared to an increase in the prior period, and continued module cost reductions.

- As of September 30, 2022, we had approximately 9 GW_{DC} of total installed nameplate production capacity across all our facilities. We produced 2.4 GW_{DC} of solar modules during the three months ended September 30, 2022, which represented an 18% increase in module production from the same period in 2021. The increase in production was primarily driven by higher throughput at our manufacturing facilities. We expect to produce between 8.9 GW_{DC} and 9.0 GW_{DC} of solar modules during 2022.

- During the three months ended September 30, 2022, we announced plans to expand our manufacturing capacity by an additional 4.4 GW_{DC} by constructing our fourth manufacturing facility in the United States and increasing our manufacturing footprint at our existing facilities in Ohio. Such expansion plans, in combination with our previously announced expansion plans, are expected to increase our manufacturing capacity by approximately 11 GW_{DC} by 2025.

Market Overview

Solar energy is one of the fastest growing forms of renewable energy with numerous economic and environmental benefits that make it an attractive complement to and/or substitute for traditional forms of energy generation. In recent years, the cost of producing electricity from PV solar power systems has decreased to levels that are competitive with or below the price of electricity in many markets. This price decline has opened new possibilities to develop systems in many locations with limited or no financial incentives, thereby promoting the widespread adoption of solar energy. Additionally, recently enacted government support programs, such as the IRA, have contributed to this momentum by providing solar module manufacturers, project developers, and project owners with tax incentives to accelerate the ongoing transition to clean energy. Among other things, the IRA (i) reinstates the 30% investment tax credit for qualifying solar projects that meet certain wage and apprenticeship requirements, (ii) extends the production tax credit (“PTC”) to include energy generated from solar projects, (iii) provides incremental investment and production tax credits for solar projects that meet certain domestic content and location requirements, and (iv) offers tax credits for solar modules and solar module components manufactured in the United States and sold to third parties. The provisions of the IRA are generally effective for tax years beginning after 2022.

Supply and demand. As a result of the market opportunities described above, we are in the process of expanding our manufacturing capacity by approximately 11 GW_{DC}, including the construction of our third manufacturing facility in the United States, which is expected to commence operations in the first half of 2023; our first manufacturing facility in India, which is expected to commence operations in the second half of 2023; our fourth manufacturing facility in the United States, which is expected to commence operations in 2025, contingent upon permitting and pending approval of various federal, state, and local incentives; and the expansion of our manufacturing footprint at our existing facilities in Ohio. In the aggregate, we believe manufacturers of solar cells and modules, particularly those in China, have significant installed production capacity, relative to global demand, and the ability for additional capacity expansion. Accordingly, we believe the solar industry may experience periods of structural imbalance between supply and demand, which could lead to periods of pricing volatility. In light of such market realities, we continue to focus on our strategies and points of differentiation, which include our advanced module technology, our manufacturing process, our R&D capabilities, the sustainability advantage of our modules, and our financial stability.

Pricing competition. The solar industry has been characterized by intense pricing competition, both at the module and system levels. This competition may result in an environment in which pricing falls rapidly, thereby potentially increasing demand for solar energy solutions but constraining the ability for project developers and module manufacturers to sustain meaningful and consistent profitability. Module average selling prices in many global markets have declined for several years and are expected to continue to decline in the long-term. However, in certain markets, module average selling prices have been favorably influenced by trade measures and policies, government regulations, raw material availability, and supply chain disruptions. For example, module spot pricing in the United States has increased, in part, due to elevated commodity and logistics costs and, more recently, due to the rising demand for modules manufactured in the United States as a result of the IRA described above. While the duration of this elevated period of pricing is uncertain, module average selling prices in the United States are expected to remain elevated for the next several years.

Competitive pricing for modules and systems, relative to the cost of traditional forms of energy generation, is expected to contribute to diversification in global electricity generation and further demand for solar energy. Our results of operations could be adversely affected if competitors reduce pricing to levels below their costs, bid aggressively low prices for module sale agreements, or are able to operate at minimal or negative operating margins for sustained periods of time. For certain of our competitors, including many in China, these practices may be enabled by their direct or indirect access to sovereign capital or other forms of state-owned support. Additionally, in certain markets an oversupply imbalance at the grid level may reduce short-to-medium term demand for new solar installations relative to prior years, lower pricing for power purchase agreements ("PPAs"), and lower margins on module and system sales to such markets. However, we believe the effects of such imbalance can be mitigated by modern solar power plants and energy storage solutions that offer a flexible operating profile, thereby promoting greater grid stability and enabling a higher penetration of solar energy. We continue to address these uncertainties, in part, by executing on our module technology improvements and implementing certain other cost reduction initiatives.

Diverse offerings. We face intense competition from manufacturers of crystalline silicon solar modules and other emerging technologies. Solar module manufacturers compete with one another on sales price per watt, which may be influenced by several module value attributes, including wattage (through a larger form factor or an improved conversion efficiency), energy yield, degradation, sustainability, and reliability. Sales price per watt may also be influenced by warranty terms and customer payment terms. While conventional solar modules are monofacial, meaning their ability to produce energy is a function of direct and diffuse irradiance on their front side, most module manufacturers offer bifacial modules that also capture diffuse irradiance on the back side of a module. We currently produce monofacial solar modules and, based on recent R&D activities, expect to produce bifacial solar modules in the near term. Bifaciality compromises nameplate efficiency, but by converting both front and rear side irradiance, such technology may improve the overall energy production of a module relative to nameplate efficiency when applied in certain applications, which could potentially lower the overall levelized cost of electricity ("LCOE") of a system when compared to systems using conventional solar modules, including the modules we currently produce. Additionally, certain module manufacturers have introduced n-type mono-crystalline modules, such as tunnel oxide passivated contact modules, which are expected to provide certain improvements to module efficiency, temperature coefficient, and bifacial performance, and claim to provide certain degradation advantages compared to other mono-crystalline modules.

Production efficiencies. We believe we are among the lowest cost module manufacturers in the solar industry on a module cost per watt basis, based on publicly available information. This cost competitiveness allows us to compete favorably in markets where pricing for modules and systems is highly competitive. Our cost competitiveness is based in large part on our advanced thin film semiconductor technology, module wattage (or conversion efficiency), proprietary manufacturing process (which enables us to produce a CdTe module in a matter of hours using a continuous and highly automated industrial manufacturing process, as opposed to a batch process), and our focus on operational excellence. In addition, our CdTe modules use approximately 2% of the amount of semiconductor material that is used to manufacture conventional crystalline silicon solar modules. The cost of polysilicon is a significant driver of the manufacturing cost of crystalline silicon solar modules, and the timing and rate of change in the cost of silicon feedstock and polysilicon could lead to changes in solar module pricing levels. In recent years, polysilicon consumption per cell has been reduced through various initiatives, such as the adoption of diamond wire saw technology, which have contributed to declines in our relative manufacturing cost competitiveness over conventional crystalline silicon module manufacturers.

Energy performance. In many climates our solar modules provide certain energy production advantages relative to competing crystalline silicon solar modules. For example, our CdTe solar technology provides:

- a superior temperature coefficient, which results in stronger system performance in typical high insolation climates as the majority of a system's generation, on average, occurs when module temperatures are well above 25°C (standard test conditions);

- a superior spectral response in humid environments where atmospheric moisture alters the solar spectrum relative to standard test conditions;

- a better partial shading response than competing crystalline silicon technologies, which may experience significantly lower energy generation than CdTe solar modules when partial shading occurs; and

- an immunity to cell cracking and its resulting power output loss, a common failure often observed in crystalline silicon modules caused by poor manufacturing, handling, weather, or other conditions.

In addition to these technological advantages, we also warrant that our solar modules will produce at least 98% of their labeled power output rating during the first year, with the warranty coverage reducing by a degradation factor between 0.3% and 0.5%, depending on the module series, every year thereafter throughout the limited power output warranty period of up to 30 years. As a result of these and other factors, our solar modules can produce more annual energy in real world operating conditions than conventional crystalline silicon modules with the same nameplate capacity.

While our modules are generally competitive in cost, reliability, and performance attributes, there can be no guarantee such competitiveness will continue to exist in the future to the same extent or at all. Any declines in the competitiveness of our products could result in further declines in the average selling prices of our modules and additional margin compression. We continue to focus on enhancing the competitiveness of our solar modules by accelerating progress along our module technology and cost reduction roadmaps.

Certain Trends and Uncertainties

We believe that our business, financial condition, and results of operations may be favorably or unfavorably impacted by the following trends and uncertainties. See Item 1A. "Risk Factors" of our Annual Report on Form 10-K for the year ended December 31, 2021 for discussions of other risks (the "Risk Factors") that may affect us.

Our business is evolving worldwide and is shaped by the varying ways in which our offerings can be compelling and economically viable solutions to energy needs in various markets. In addressing electricity demands, we are focused on providing utility-scale module offerings in key geographic markets that we believe have a compelling need for mass-scale PV solar electricity, including markets throughout the United States, India, and Europe. We closely evaluate and monitor the appropriate level of resources required to support such markets and their associated sales opportunities. When deployed in utility-scale applications, our modules provide energy at a lower LCOE compared to traditional forms of energy generation, making them an attractive alternative to or replacement for aging fossil fuel-based generation resources. Accordingly, future retirements of aging energy generation resources represent a significant increase in the potential market for solar energy.

This focus on utility-scale module offerings exists within a current market environment that includes rooftop and distributed generation solar. We believe that utility-scale solar will continue to be a compelling offering for companies with technology and cost leadership and will continue to represent an increasing portion of the overall electricity generation mix. However, our module offerings in certain markets may be driven, in part, by future demand for rooftop and distributed generation solar solutions. For example, we continue to evaluate opportunities to develop and leverage other solar cell technologies in multi-junction applications that utilize our thin film PV technology. We believe such applications have the potential to enable our module conversion efficiency to 24% by 2025 and 28% by 2030.

Demand for our solar energy solutions depends, in part, on market factors outside our control. For example, many governments have proposed or enacted policies or support programs intended to encourage renewable energy investments to achieve decarbonization objectives and/or establish greater energy independence. While we compete in many markets that do not require solar-specific government subsidies or support programs, our net sales and profits remain subject to variability based on the availability and size of government subsidies and economic incentives. Adverse changes in these factors could increase the cost of utility-scale systems, which could reduce demand for our solar modules. Recent developments to government support programs include the following:

- *United States*. In August 2022, the U.S. President signed the IRA into law, which is intended to accelerate the country's ongoing transition to clean energy. The provisions of the IRA are generally effective for tax years beginning after 2022. Among other things, the financial incentives provided by the IRA are expected to significantly increase demand for modules manufactured in the United States. Accordingly, the demand for these solar modules is expected to increase domestic manufacturing in the near term, which may result in localized supply chain constraints and periods of inflationary pricing for certain of our key raw materials, including substrate glass and cover glass. The financial incentives provided by the IRA are also expected to significantly increase demand for solar modules in general due to the incremental tax credit available for the qualified production of clean hydrogen that is powered by renewable resources. Given the complexities of the IRA, which is pending technical guidance and regulations from the Internal Revenue Service and U.S. Treasury Department, we continue to evaluate the full extent of benefits available to us, which are expected to favorably impact our results of operations in future periods. For example, we currently expect to qualify for the advanced manufacturing production tax credit under Section 45X of the Internal Revenue Code, which provides certain specified benefits for solar modules and solar module components manufactured in the United States and sold to third parties. Such credits, which may be refundable to us or transferable to a third party, are available at their specified credit amounts through 2029 and are scheduled to phase out starting in the 2030 tax year with full phase out by the end of 2032.

- *India*. In September 2022, the government of India approved an expansion to its Production Linked Incentive ("PLI") scheme to INR 195 billion ($2.5 billion), which is intended to promote the manufacturing of high efficiency solar modules in India and to reduce India's dependency on foreign imports of solar modules. Under the PLI scheme, manufacturers are selected through a competitive bid process and receive certain cash incentives over a five-year period following the commissioning of their manufacturing facilities. Among other things, such incentives are based on the efficiency and temperature coefficient of the modules produced, the proportion of raw materials sourced from the domestic market, the extent to which the manufacturer's operations are fully integrated within India, and the quantity of modules sold from such manufacturing operations. At this time, it is uncertain whether and to what extent we may qualify for such incentives.

Demand for our solar energy solutions also depends on domestic or international trade policies and government regulations, which may be proposed, revised, and/or enacted across short- and long-term time horizons with varying degrees of impact to our net sales, profit, and manufacturing operations. Changes in these policies and regulations could adversely impact the competitive landscape of solar markets, which could reduce demand for our solar modules. Recent revisions or proposed changes to trade policy and government regulations include the following:

- *United States*. In June 2022, the U.S. President authorized the U.S. Secretary of Commerce to provide a 24-month antidumping and countervailing duty tariff exemption for imported solar panels from certain Southeast Asian countries. For more information about this development, see Item 1A. "Risk Factors." Separately, the U.S. President also authorized the use of the Defense Production Act to expand domestic production of clean energy technologies. At this time, it is uncertain what impact, if any, these developments will have on future investments in solar module manufacturing in the United States.

- *United States*. In June 2022, the U.S. Supreme Court issued a ruling in *West Virginia, et al. v. Environmental Protection Agency, et al.*, which limited the Environmental Protection Agency's ("EPA") ability to regulate greenhouse gas ("GHG") emissions under the Clean Air Act using a "generation shifting" approach from coal-fired power plants to renewable energy sources over time. At this time, it is unclear what effect this ruling will have on future EPA regulation of GHG emissions, the U.S. President's climate change initiatives, internationally agreed-upon climate goals, the extent and timing of future coal plant retirements in the United States, and/or future investments in renewable energy.

- *India*. In May 2022, the government of India, through its Ministry of Environment, Forest and Climate Change and Ministry of New and Renewable Energy ("MNRE"), proposed legislation intended to regulate electronic waste ("e-waste"). Among other things, such proposed legislation expands the scope of India's existing e-waste regulations to include PV solar modules, including certain recycling obligations for solar module manufacturers, and limits the use of certain hazardous substances, such as cadmium. The MNRE has engaged various stakeholders, including First Solar, in an effort to propose modifications intended to closely align this policy with the European Union's Waste Electrical and Electronic Equipment Directive. At this time, it is unclear whether and to what extent such policy will be enacted into law. If such legislation is successfully signed into law without modification, it could negatively impact our business, financial condition, and results of operations.

Our ability to provide solar modules on economically attractive terms is also affected by the availability and cost of logistics services associated with the procurement of raw materials or equipment used in our manufacturing process and the shipping, handling, storage, and distribution of our modules. For example, the cost of ocean freight throughout many parts of the world remains at elevated levels, relative to pre-COVID-19 pandemic rates, primarily due to port congestion, cancellations of shipments by logistics providers, and elevated fuel costs. Such factors may disrupt our supply chain and adversely impact our manufacturing operations as several of our key raw materials and components are either single-sourced or sourced from a limited number of international suppliers. We may also incur additional logistics costs, such as demurrage and detention, to the extent we are unable to retrieve or return our shipping containers in a timely manner. To mitigate such costs and better meet our customer commitments, we may adjust our shipping plans to include additional lead times for module deliveries and/or utilize our network of U.S. distribution centers. We are also employing module contract structures that provide additional consideration to us if the cost of logistics services, excluding demurrage and detention, exceeds a defined threshold. Additionally, our manufacturing capacity expansions in the U.S. and India are expected to bring manufacturing activities closer to customer demand, further mitigating our exposure to the cost of ocean freight. While it is currently unclear how long these issues will persist, they may be further exacerbated by the disruption of major shipping routes or other economic disruptions.

We generally price and sell our solar modules on a per watt basis. As of September 30, 2022, we had entered into contracts with customers for the future sale of 50.0 GW_{DC} of solar modules for an aggregate transaction price of $14.0 billion, which we expect to recognize as revenue through 2027 as we transfer control of the modules to the customers. Such volume includes contracts for the sale of 31.4 GW_{DC} of solar modules that include transaction price adjustments associated with future module technology improvements, including new product designs and enhancements to certain energy related attributes. Based on these potential technology improvements, the contracted module volumes as of September 30, 2022, and the expected timing of module deliveries, such adjustments, if realized, could result in additional revenue of up to $0.7 billion, the majority of which would be recognized in 2024, 2025, and 2026. In addition to these price adjustments, certain of our contracts with customers may also include potential price adjustments associated with the extension of the U.S. ITC, sales freight, and changes to certain commodity prices.

We continually evaluate forecasted global demand, competition, and our addressable market and seek to effectively balance manufacturing capacity with market demand and the nature and extent of our competition. We continue to increase the nameplate production capacity of our existing manufacturing facilities by improving our production throughput, increasing module wattage (or conversion efficiency), and improving manufacturing yield losses. Additionally, we are in the process of expanding our manufacturing capacity by approximately 11 $GW_{DC,}$ including the construction of our third manufacturing facility in the United States, which is expected to commence operations in the first half of 2023; our first manufacturing facility in India, which is expected to commence operations in the second half of 2023; our fourth manufacturing facility in the United States, which is expected to commence operations in 2025, contingent upon permitting and pending approval of various federal, state, and local incentives; and the expansion of our manufacturing footprint at our existing facilities in Ohio. This additional capacity, and any other potential investments to add or otherwise modify our existing manufacturing capacity in response to market demand and competition, may require significant internal and possibly external sources of capital, and may be subject to certain risks and uncertainties described in the Risk Factors.

In response to the COVID-19 pandemic, governmental authorities have recommended or ordered the limitation or cessation of certain business or commercial activities in jurisdictions in which we do business or have operations. While some of these orders permit the continuation of essential business operations, or permit the performance of minimum business activities, these orders are subject to continuous revision or may be revoked or superseded, or our understanding of the applicability of these orders and exemptions may change at any time. As a result, we may at any time be ordered by governmental authorities, or we may determine, based on our understanding of the recommendations or orders of governmental authorities or the availability of our personnel, that we have to curtail or cease business operations or activities altogether, including manufacturing, fulfillment, R&D activities, the implementation of our technology roadmap, or construction activities associated with our expanding manufacturing capacity. At this time, such limitations have had a minimal effect on our manufacturing facilities. We maintain company plans and policies to implement all necessary safety precautions to protect our personnel as the COVID-19 pandemic evolves. Our R&D and manufacturing expansion activities may be delayed due to travel restrictions, quarantine requirements, other government orders, or increases in COVID-19 infection rates. Refer to the Risk Factors for more information related to impacts of COVID-19 on our business.

Results of Operations

The following table sets forth our condensed consolidated statements of operations as a percentage of net sales for the three and nine months ended September 30, 2022 and 2021:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2022	2021	2022	2021
Net sales	100.0 %	100.0 %	100.0 %	100.0 %
Cost of sales	96.7 %	78.6 %	99.4 %	76.0 %
Gross profit	3.3 %	21.4 %	0.6 %	24.0 %
Selling, general and administrative	7.4 %	7.5 %	7.5 %	6.5 %
Research and development	4.6 %	4.4 %	5.0 %	3.4 %
Production start-up	3.1 %	0.5 %	2.5 %	0.8 %
Gain on sales of businesses, net	1.0 %	(0.3)%	15.7 %	7.3 %
Operating (loss) income	(10.9)%	8.7 %	1.2 %	20.5 %
Foreign currency loss, net	(0.8)%	(0.2)%	(0.7)%	(0.2)%
Interest income	1.6 %	0.3 %	0.9 %	0.2 %
Interest expense, net	(0.5)%	(0.5)%	(0.6)%	(0.5)%
Other income (expense), net	0.8 %	(0.4)%	0.2 %	0.1 %
Income tax benefit (expense)	2.0 %	(0.1)%	(3.2)%	(3.4)%
Net (loss) income	(7.8)%	7.7 %	(2.3)%	16.7 %

Segment Overview

Our primary segment is our modules business, which involves the design, manufacture, and sale of CdTe solar modules, which convert sunlight into electricity. Third-party customers of our modules segment include developers and operators of PV solar power systems. Our residual business operations include the results of operations from PV solar power systems we own and operate in certain international regions, as well as certain O&M services and project development activities.

For the year ended December 31, 2021, we changed our reportable segments to align with revisions to our internal reporting structure and long-term strategic plans. Following this change, our modules business represents our only reportable segment. We previously operated our business in two segments, which included our modules and systems businesses. Systems business activities primarily involved (i) project development, (ii) EPC services, and (iii) O&M services, which now comprise our residual business operations and are categorized as “Other” in the tables below. All prior year balances were revised to conform to the current year presentation.

Net sales

We generally price and sell our solar modules on a per watt basis. During the three and nine months ended September 30, 2022, we sold the majority of our solar modules to developers and operators of systems in the United States, and substantially all of our modules business net sales were denominated in U.S. dollars. We recognize revenue for module sales at a point in time following the transfer of control of the modules to the customer, which typically occurs upon shipment or delivery depending on the terms of the underlying contracts. Net sales from our residual business operations primarily consists of revenue recognized for sales of development projects or completed systems, including any modules installed in such systems and any revenue from energy generated by such systems. In certain prior periods, our residual business operations also included EPC services we provided to third parties.

The following table shows net sales by reportable segment for the three and nine months ended September 30, 2022 and 2021:

(Dollars in thousands)	Three Months Ended September 30, 2022	Three Months Ended September 30, 2021	Three Month Change		Nine Months Ended September 30, 2022	Nine Months Ended September 30, 2021	Nine Month Change	
Modules	$ 619,922	$ 562,810	$ 57,112	10 %	$ 1,582,248	$ 1,640,436	$ (58,188)	(4)%
Other	9,011	20,694	(11,683)	(56)%	34,680	375,622	(340,942)	(91)%
Net sales	$ 628,933	$ 583,504	$ 45,429	8 %	$ 1,616,928	$ 2,016,058	$ (399,130)	(20)%

Net sales from our modules segment increased $57.1 million for the three months ended September 30, 2022 compared to the three months ended September 30, 2021 primarily due to a 23% increase in the volume of watts sold, partially offset by a 10% decrease in the average selling price per watt. Net sales from our residual business operations decreased $11.7 million for the three months ended September 30, 2022 compared to the three months ended September 30, 2021 primarily due to a favorable settlement with a customer in the prior period.

Net sales from our modules segment decreased $58.2 million for the nine months ended September 30, 2022 compared to the nine months ended September 30, 2021 primarily due to a 12% decrease in the average selling price per watt, partially offset by a 10% increase in the volume of watts sold. Net sales from our residual business operations decreased $340.9 million for the nine months ended September 30, 2022 compared to the nine months ended September 30, 2021 primarily due to sales of certain projects in the United States in the prior period and the settlement of an outstanding indemnification arrangement associated with the sale of one of our projects. Under the terms of the indemnification arrangement, we received $65.1 million for our portion of the settlement payment, which we recorded as revenue in the prior period. See Note 10. “Commitments and Contingencies” to our condensed consolidated financial statements for discussion of our indemnification arrangements.

Cost of sales

Our modules business cost of sales includes the cost of raw materials and components for manufacturing solar modules, such as glass, transparent conductive coatings, CdTe and other thin film semiconductors, laminate materials, connector assemblies, edge seal materials, and frames. In addition, our cost of sales includes direct labor for the manufacturing of solar modules and manufacturing overhead, such as engineering, equipment maintenance, quality and production control, and information technology. Our cost of sales also includes depreciation of manufacturing plant and equipment, facility-related expenses, environmental health and safety costs, and costs associated with shipping, warranties, and solar module collection and recycling (excluding accretion). Cost of sales for our residual business operations primarily consists of project-related costs, such as development costs (legal, consulting, transmission upgrade, interconnection, permitting, and other similar costs), EPC costs (consisting primarily of solar modules, inverters, electrical and mounting hardware, project management and engineering, and construction labor), and site-specific costs.

The following table shows cost of sales by reportable segment for the three and nine months ended September 30, 2022 and 2021:

(Dollars in thousands)	Three Months Ended September 30, 2022	Three Months Ended September 30, 2021	Three Month Change		Nine Months Ended September 30, 2022	Nine Months Ended September 30, 2021	Nine Month Change	
Modules	$ 595,882	$ 444,550	$ 151,332	34 %	$ 1,515,852	$ 1,312,389	$ 203,463	16 %
Other	12,069	14,374	(2,305)	(16)%	91,831	220,204	(128,373)	(58)%
Total cost of sales	$ 607,951	$ 458,924	$ 149,027	32 %	$ 1,607,683	$ 1,532,593	$ 75,090	5 %
% of net sales	96.7 %	78.6 %			99.4 %	76.0 %		

Cost of sales increased $149.0 million, or 32%, and increased 18.1 percentage points as a percent of net sales for the three months ended September 30, 2022 compared to the three months ended September 30, 2021. The increase in cost of sales was driven by a $151.3 million increase in our modules segment cost of sales primarily as a result of the following:

- higher costs of $101.3 million from an increase in the volume of modules sold;
- higher sales freight, demurrage, and detention charges of $59.4 million; and
- a reduction to our product warranty liability of $33.1 million in 2021 due to reductions to our projected module return rates; partially offset by
- continued module cost reductions, which decreased cost of sales by $11.8 million;
- an increase to our module collection and recycling liability of $10.8 million in 2021 due to lower estimated by-product credits for certain semiconductor materials recovered during the recycling process and updates to certain valuation assumptions;
- a reduction to our product warranty liability of $10.2 million in 2022 due to reductions to our projected module return rates; and
- a reduction to our module collection and recycling liability of $7.5 million in 2022 due to lower estimated capital and chemical costs resulting from improvements to our module recycling technology.

Cost of sales increased $75.1 million, or 5%, and increased 23.4 percentage points as a percent of net sales for the nine months ended September 30, 2022 compared to the nine months ended September 30, 2021. The increase in cost of sales was driven by a $203.5 million increase in our modules segment cost of sales primarily as a result of the following:

- higher costs of $124.3 million from an increase in the volume of modules sold;
- higher sales freight, demurrage, and detention charges of $114.2 million; and
- the reduction to our product warranty liability of $33.1 million in 2021 described above; partially offset by
- continued module cost reductions, which decreased cost of sales by $35.9 million;
- the increase to our module collection and recycling liability of $10.8 million in 2021 described above;
- the reduction to our product warranty liability of $10.2 million in 2022 described above;
- manufacturing charges of $9.9 million in the prior period associated with the COVID-19 pandemic; and
- the reduction to our module collection and recycling liability of $7.5 million in 2022 described above.

The increase in cost of sales was partially offset by a $128.4 million decrease in our residual business operations cost of sales primarily due to sales of certain projects in the United States in the prior period, partially offset by the impairment loss in the current period for our Luz del Norte PV solar power plant. See Note 5. “Consolidated Balance Sheet Details” to our condensed consolidated financial statements for discussion of the impairment of our Luz del Norte project.

Gross profit

Gross profit may be affected by numerous factors, including the selling prices of our modules and the selling prices of projects and services included in our residual business operations, our manufacturing costs, project development costs, the capacity utilization of our manufacturing facilities, and foreign exchange rates. Gross profit may also be affected by the mix of net sales from our modules business and residual business operations.

The following table shows gross profit for the three and nine months ended September 30, 2022 and 2021:

(Dollars in thousands)	Three Months Ended September 30, 2022	Three Months Ended September 30, 2021	Three Month Change		Nine Months Ended September 30, 2022	Nine Months Ended September 30, 2021	Nine Month Change	
Gross profit	$ 20,982	$ 124,580	$ (103,598)	(83)%	$ 9,245	$ 483,465	$ (474,220)	(98)%
% of net sales	3.3 %	21.4 %			0.6 %	24.0 %		

Gross profit decreased 18.1 percentage points to 3.3% during the three months ended September 30, 2022 from 21.4% during the three months ended September 30, 2021 primarily due to a decrease in the average selling price per watt of our modules, an increase in sales freight, demurrage, and detention charges, a lower benefit from reductions to our product warranty liability described above, and the favorable settlement with a customer in the prior period mentioned above. These decreases to gross profit were partially offset by the higher volume of modules sold, the decrease to our module collection and recycling liability in the current period compared to the increase in the prior period described above, and continued module cost reductions.

Gross profit decreased 23.4 percentage points to 0.6% during the nine months ended September 30, 2022 from 24.0% during the nine months ended September 30, 2021 primarily due to a decrease in the average selling price per watt of our modules, an increase in sales freight, demurrage, and detention charges, the volume of higher gross profit projects sold during the prior period, the impairment loss in the current period for our Luz del Norte PV solar power plant described above, and the prior period indemnification matter described above. These decreases to gross profit were partially offset by the higher volume of modules sold and continued module cost reductions.

Selling, general and administrative

Selling, general and administrative expense consists primarily of salaries and other personnel-related costs, professional fees, insurance costs, and other business development and selling expenses.

The following table shows selling, general and administrative expense for the three and nine months ended September 30, 2022 and 2021:

(Dollars in thousands)	Three Months Ended September 30, 2022	Three Months Ended September 30, 2021	Three Month Change		Nine Months Ended September 30, 2022	Nine Months Ended September 30, 2021	Nine Month Change	
Selling, general and administrative	$ 46,368	$ 43,476	$ 2,892	7 %	$ 121,990	$ 131,909	$ (9,919)	(8)%
% of net sales	7.4 %	7.5 %			7.5 %	6.5 %		

Selling, general and administrative expense for the three months ended September 30, 2022 increased compared to the three months ended September 30, 2021, primarily due to an increase in employee compensation expense driven by higher share-based compensation and employee bonus expenses, partially offset by higher charges for impairments of certain project assets in the prior period.

Selling, general and administrative expense for the nine months ended September 30, 2022 decreased compared to the nine months ended September 30, 2021 primarily due to higher charges for impairments of certain project assets in the prior period, a decrease in employee compensation expense driven by reductions in headcount from the sales of our North American O&M operations and U.S. project development business in the prior period, lower professional fees, and lower expected credit losses for our accounts receivable, partially offset by an increase in employee compensation expense driven by higher share-based compensation and employee bonus expenses.

Research and development

Research and development expense consists primarily of salaries and other personnel-related costs; the cost of products, materials, and outside services used in our R&D activities; and depreciation and amortization expense associated with R&D specific facilities and equipment. We maintain a number of programs and activities to improve our technology and processes in order to enhance the performance and reduce the costs of our solar modules.

The following table shows research and development expense for the three and nine months ended September 30, 2022 and 2021:

	Three Months Ended September 30,				Nine Months Ended September 30,			
(Dollars in thousands)	**2022**	**2021**	**Three Month Change**		**2022**	**2021**	**Nine Month Change**	
Research and development	$ 29,183	$ 25,426	$ 3,757	15 %	$ 81,520	$ 69,234	$ 12,286	18 %
% of net sales	4.6 %	4.4 %			5.0 %	3.4 %		

Research and development expense for the three months ended September 30, 2022 increased compared to the three months ended September 30, 2021 primarily due to higher employee compensation expense resulting from an increase in headcount.

Research and development expense for the nine months ended September 30, 2022 increased compared to the nine months ended September 30, 2021 primarily due to higher employee compensation expense resulting from an increase in headcount, increased material and module testing costs, lower share-based compensation expense in the prior period driven by the forfeiture of unvested shares by our former Chief Technology Officer, who retired in March 2021, and increased freight costs.

Production start-up

Production start-up expense consists of costs associated with operating a production line before it is qualified for commercial production, including the cost of raw materials for solar modules run through the production line during the qualification phase, employee compensation for individuals supporting production start-up activities, and applicable facility related costs. Production start-up expense also includes costs related to the selection of a new site and implementation costs for manufacturing process improvements to the extent we cannot capitalize these expenditures.

The following table shows production start-up expense for the three and nine months ended September 30, 2022 and 2021:

	Three Months Ended September 30,				Nine Months Ended September 30,			
(Dollars in thousands)	**2022**	**2021**	**Three Month Change**		**2022**	**2021**	**Nine Month Change**	
Production start-up	$ 19,768	$ 2,945	$ 16,823	>100%	$ 40,337	$ 16,014	$ 24,323	152 %
% of net sales	3.1 %	0.5 %			2.5 %	0.8 %		

During the three and nine months ended September 30, 2022, we incurred production start-up expense primarily for our third manufacturing facility in the U.S. and for certain manufacturing upgrades at our Malaysian facilities.

During the three months ended September 30, 2021, we incurred production start-up expense primarily for certain manufacturing upgrades at our facilities in Kulim, Malaysia. During the nine months ended September 30, 2021, we incurred production start-up expense primarily for the transition to Series 6 module manufacturing at our second facility in Kulim, Malaysia, which commenced commercial production in early 2021.

Gain on sales of businesses, net

The following table shows gain on sales of businesses, net for the three and nine months ended September 30, 2022 and 2021:

	Three Months Ended September 30,				Nine Months Ended September 30,			
(Dollars in thousands)	**2022**	**2021**	**Three Month Change**		**2022**	**2021**	**Nine Month Change**	
Gain on sales of businesses, net	$ 5,984	$ (1,866)	$ 7,850	421 %	$ 253,272	$ 147,284	$ 105,988	72 %
% of net sales	1.0 %	(0.3)%			15.7 %	7.3 %		

During the three months ended September 30, 2022, we completed the sales of certain international O&M operations to a subsidiary of Clairvest and PAG. During the nine months ended September 30, 2022, we also completed the sales of our Japan project development business to PAG and certain other international O&M operations to a subsidiary of Clairvest. During the nine months ended September 30, 2021, we completed the sales of our North American O&M operations to a subsidiary of Clairvest and our U.S. project development business to Leeward. See Note 2. "Sales of Businesses" to our condensed consolidated financial statements for further information related to these transactions.

Foreign currency loss, net

Foreign currency loss, net consists of the net effect of gains and losses resulting from holding assets and liabilities and conducting transactions denominated in currencies other than our subsidiaries' functional currencies.

The following table shows foreign currency loss, net for the three and nine months ended September 30, 2022 and 2021:

	Three Months Ended September 30,				Nine Months Ended September 30,			
(Dollars in thousands)	**2022**	**2021**	**Three Month Change**		**2022**	**2021**	**Nine Month Change**	
Foreign currency loss, net	$ (4,859)	$ (1,018)	$ (3,841)	377 %	$ (12,041)	$ (4,613)	$ (7,428)	161 %

Foreign currency loss, net for the three and nine months ended September 30, 2022 increased compared to the three and nine months ended September 30, 2021 primarily due to the differences between our economic hedge positions and the underlying exposures and higher costs associated with hedging activities related to our subsidiaries in India.

Interest income

Interest income is earned on our cash, cash equivalents, marketable securities, restricted cash, and restricted marketable securities. Interest income also includes interest earned from late customer payments.

The following table shows interest income for the three and nine months ended September 30, 2022 and 2021:

	Three Months Ended September 30,				Nine Months Ended September 30,			
(Dollars in thousands)	**2022**	**2021**	**Three Month Change**		**2022**	**2021**	**Nine Month Change**	
Interest income	$ 9,749	$ 1,752	$ 7,997	456 %	$ 14,954	$ 3,996	$ 10,958	274 %

Interest income for the three and nine months ended September 30, 2022 increased compared to the three and nine months ended September 30, 2021 primarily due to higher interest rates on cash, time deposits, and restricted marketable securities.

Interest expense, net

Interest expense, net is primarily comprised of interest incurred on long-term debt, settlements of interest rate swap contracts, and changes in the fair value of interest rate swap contracts that do not qualify for hedge accounting in accordance with ASC 815. We may capitalize interest expense to our project assets or property, plant and equipment when such costs qualify for interest capitalization, which reduces the amount of net interest expense reported in any given period.

The following table shows interest expense, net for the three and nine months ended September 30, 2022 and 2021:

(Dollars in thousands)	Three Months Ended September 30, 2022	Three Months Ended September 30, 2021	Three Month Change		Nine Months Ended September 30, 2022	Nine Months Ended September 30, 2021	Nine Month Change	
Interest expense, net	$ (2,991)	$ (2,958)	$ (33)	1 %	$ (9,092)	$ (10,577)	$ 1,485	(14)%

Interest expense, net for the three months ended September 30, 2022 was consistent with the three months ended September 30, 2021. Interest expense, net for the nine months ended September 30, 2022 decreased compared to the nine months ended September 30, 2021 primarily due to changes in the fair value of interest rate swap contracts in the prior period, which did not qualify for hedge accounting, lower amortization of debt discounts and issuance costs in the current period, and lower interest expense associated with project debt.

Other income (expense), net

Other income (expense), net is primarily comprised of miscellaneous items and realized gains and losses on the sale of marketable securities and restricted marketable securities.

The following table shows other income (expense), net for the three and nine months ended September 30, 2022 and 2021:

(Dollars in thousands)	Three Months Ended September 30, 2022	Three Months Ended September 30, 2021	Three Month Change		Nine Months Ended September 30, 2022	Nine Months Ended September 30, 2021	Nine Month Change	
Other income (expense), net	$ 4,774	$ (2,603)	$ 7,377	283 %	$ 2,679	$ 2,598	$ 81	3 %

Other income, net for the three months ended September 30, 2022 increased compared to the three months ended September 30, 2021 primarily due to an increase in the value of a strategic equity investment. Other income, net for the nine months ended September 30, 2022 increased compared to the nine months ended September 30, 2021 primarily due to the valuation increase of a strategic equity investment mentioned above, partially offset by higher realized gains from sales of restricted marketable securities in the prior period.

Income tax benefit (expense)

Income tax expense or benefit, deferred tax assets and liabilities, and liabilities for unrecognized tax benefits reflect our best estimate of current and future taxes to be paid. We are subject to income taxes in both the United States and numerous foreign jurisdictions in which we operate, principally Japan, Malaysia, and Vietnam. Significant judgments and estimates are required to determine our consolidated income tax expense. The statutory federal corporate income tax rate in the United States is 21%, and the tax rates in Japan, Malaysia, and Vietnam are 30.6%, 24%, and 20%, respectively. In Malaysia, we have been granted a long-term tax holiday, scheduled to expire in 2027, pursuant to which substantially all of our income earned in Malaysia is exempt from income tax, conditional upon our continued compliance with certain employment and investment thresholds. In Vietnam, we have been granted a long-term tax incentive, scheduled to expire at the end of 2036, pursuant to which income earned in Vietnam is subject to reduced annual tax rates, conditional upon our continued compliance with certain revenue and R&D spending thresholds.

The following table shows income tax benefit (expense) for the three and nine months ended September 30, 2022 and 2021:

(Dollars in thousands)	Three Months Ended September 30, 2022	Three Months Ended September 30, 2021	Three Month Change		Nine Months Ended September 30, 2022	Nine Months Ended September 30, 2021	Nine Month Change	
Income tax benefit (expense)	$ 12,512	$ (837)	$ 13,349	(>100%)	$ (51,788)	$ (67,673)	$ 15,885	(23)%
Effective tax rate	20.3 %	1.8 %			341.4 %	16.7 %		

Our tax rate is affected by recurring items, such as tax rates in foreign jurisdictions and the relative amounts of income we earn in those jurisdictions. The rate is also affected by discrete items that may occur in any given period, but are not consistent from period to period. Income tax benefit increased by $13.3 million during the three months ended September 30, 2022 compared to the three months ended September 30, 2021 primarily due to our pretax loss in the current period, partially offset by losses in certain jurisdictions for which no tax benefit could be recorded. Income tax expense decreased by $15.9 million during the nine months ended September 30, 2022 compared to the nine months ended September 30, 2021 primarily due to our lower pretax income in the current period, partially offset by losses in certain jurisdictions for which no tax benefit could be recorded and the remeasurement of our net deferred tax assets in Vietnam as a result of a long-term tax incentive granted in May 2022.

Critical Accounting Policies and Estimates

In preparing our condensed consolidated financial statements in conformity with U.S. GAAP, we make estimates and assumptions that affect the amounts of reported assets, liabilities, revenues, and expenses, as well as the disclosure of contingent liabilities. Some of our accounting policies require the application of significant judgment in the selection of the appropriate assumptions for making these estimates. By their nature, these judgments are subject to an inherent degree of uncertainty. We base our judgments and estimates on our historical experience, our forecasts, and other available information as appropriate. We believe the judgments and estimates involved in accrued solar module collection and recycling, product warranties, accounting for income taxes, and long-lived asset impairments have the greatest potential impact on our condensed consolidated financial statements. The actual results experienced by us may differ materially and adversely from our estimates. To the extent there are material differences between our estimates and the actual results, our future results of operations will be affected. For a description of the accounting policies that require the most significant judgment and estimates in the preparation of our condensed consolidated financial statements, refer to our Annual Report on Form 10-K for the year ended December 31, 2021. There have been no material changes to our accounting policies during the nine months ended September 30, 2022.

Recent Accounting Pronouncements

None.

Liquidity and Capital Resources

As of September 30, 2022, we believe that our cash, cash equivalents, marketable securities, cash flows from operating activities, and contracts with customers for the future sale of solar modules will be sufficient to meet our working capital and capital expenditure needs for at least the next 12 months. As necessary, we also believe we will have adequate access to the capital markets. We monitor our working capital to ensure we have adequate liquidity, both domestically and internationally. We intend to maintain appropriate debt levels based upon cash flow expectations, our overall cost of capital, and expected cash requirements for operations, including near-term construction activities and purchases of manufacturing equipment for our manufacturing facilities in India and the United States. However, our ability to raise capital on terms commercially acceptable to us could be constrained if there is insufficient lender or investor interest due to company-specific, industry-wide, or broader market concerns.

Any incremental debt financings could result in increased debt service expenses and/or restrictive covenants, which could limit our ability to pursue our strategic plans.

As of September 30, 2022 we had $1.9 billion in cash, cash equivalents, and marketable securities compared to $1.8 billion as of December 31, 2021. The increase in cash, cash equivalents, and marketable securities was primarily driven by cash receipts from module sales, including advance payments for future sales, proceeds from the sales of our Japan project development business and certain international O&M operations, and proceeds from borrowings, partially offset by purchases of property, plant and equipment, expenditures for the construction of certain projects in Japan, and other operating expenditures. As of September 30, 2022, $0.8 billion of our cash, cash equivalents, and marketable securities was held by our foreign subsidiaries and was primarily based in U.S. dollar, Japanese yen, Indian rupee, and Euro denominated holdings.

We utilize a variety of tax planning and financing strategies in an effort to ensure that our worldwide cash is available in the locations in which it is needed. If certain international funds were needed for our operations in the United States, we may be required to accrue and pay certain U.S. and foreign taxes to repatriate such funds. We maintain the intent and ability to permanently reinvest our accumulated earnings outside the United States, with the exception of our subsidiaries in Canada and Germany. In addition, changes to foreign government banking regulations may restrict our ability to move funds among various jurisdictions under certain circumstances, which could negatively impact our access to capital, resulting in an adverse effect on our liquidity and capital resources.

We continually evaluate forecasted global demand and seek to balance our manufacturing capacity with such demand. We are currently in the process of expanding our capacity by approximately 11 GW_{DC}, including the construction of our third manufacturing facility in the United States, which is expected to commence operations in the first half of 2023; our first manufacturing facility in India, which is expected to commence operations in the second half of 2023; our fourth manufacturing facility in the United States, which is expected to commence operations in 2025, contingent upon permitting and pending approval of various federal, state, and local incentives; and the expansion of our manufacturing footprint at our existing facilities in Ohio. Our newest factories in the United States and India are expected to produce our next generation Series 7 modules, which combine our thin film CdTe technology with a larger form factor and an innovative steel back rail mounting system that reduces module installation time. In aggregate, we expect to invest approximately $2.5 billion for these facilities and upgrades. As we expand our manufacturing capacity, we expect to continue to receive advance payments from customers for the future sale of modules. Such advance payments are reflected as deferred revenue in our condensed consolidated balance sheets. As of September 30, 2022, our deferred revenue was approximately $0.6 billion. Accordingly, the capital expenditures necessary to expand our capacity in the near term are expected to be financed, in part, by advance payments for module sales in future periods.

In addition to the expansion plans described above, we continue to increase the nameplate production capacity of our existing manufacturing facilities by improving our production throughput, increasing module wattage (or conversion efficiency), and improving manufacturing yield losses. We have a demonstrated history of innovation, continuous improvement, and manufacturing success driven by our significant investments in various R&D initiatives. We continue to invest significant financial resources in such initiatives, and recently announced our plans to invest approximately $0.3 billion for a dedicated R&D facility in the United States to support the implementation of our technology roadmap. Such R&D facility will feature a high-tech pilot manufacturing line, allowing for the production of full-sized prototypes of thin film and tandem PV modules, and is expected to be completed in 2024. During 2022, we expect to spend $0.8 billion to $1.0 billion for capital expenditures, including the new facilities mentioned above and upgrades to machinery and equipment that we believe will further increase our module wattage and expand capacity and throughput at our manufacturing facilities.

We have also committed and expect to commit significant working capital to purchase various raw materials used in our module manufacturing process. Our failure to obtain raw materials and components that meet our quality, quantity, and cost requirements in a timely manner could interrupt or impair our ability to manufacture our solar modules or increase our manufacturing costs. Accordingly, we may enter into long-term supply agreements to mitigate potential risks related to the procurement of key raw materials and components, and such agreements may be noncancelable or cancelable with a significant penalty. For example, we have entered into long-term supply agreements for the purchase of certain specified minimum volumes of substrate glass and cover glass for our PV solar modules. Our remaining purchases under these supply agreements are expected to be approximately $1.6 billion of substrate glass and approximately $314 million of cover glass. We have the right to terminate these agreements upon payment of specified termination penalties (which, in aggregate, are up to $277 million as of September 30, 2022 and decline over the remaining supply periods). Additionally, for certain strategic suppliers, we have made, and may in the future be required to make, certain advance payments to secure the raw materials necessary for our module manufacturing.

We have also committed certain financial resources to fulfill our solar module collection and recycling obligations, and have established a trust under which these funds are put into custodial accounts with an established and reputable bank. As of September 30, 2022, such funds were comprised of restricted marketable securities of $182.2 million and restricted cash balances of $6.3 million. As of September 30, 2022, our module collection and recycling liability was $120.2 million. Trust funds may be disbursed for qualified module collection and recycling costs (including capital and facility related recycling costs), payments to customers for assuming collection and recycling obligations, and reimbursements of any overfunded amounts. Investments in the trust must meet certain investment quality criteria comparable to highly rated government or agency bonds. As necessary, we adjust the funded amounts for our estimated collection and recycling obligations on an annual basis based on the estimated costs of collecting and recycling covered modules, estimated rates of return on our restricted marketable securities, and an estimated solar module life of 25 years, less amounts already funded in prior years.

As of September 30, 2022, we had no off-balance sheet debt or similar obligations, other than financial assurance related instruments, which are not classified as debt. We do not guarantee any third-party debt. See Note 10. "Commitments and Contingencies" to our condensed consolidated financial statements for further information about our financial assurance related instruments.

Cash Flows

The following table summarizes key cash flow activity for the nine months ended September 30, 2022 and 2021 (in thousands):

	Nine Months Ended September 30,	
	2022	**2021**
Net cash provided by operating activities	$ 78,154	$ 203,092
Net cash used in investing activities	(622,519)	(83,289)
Net cash provided by (used in) financing activities	209,461	(9,210)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	39,866	1,687
Net (decrease) increase in cash, cash equivalents and restricted cash	$ (295,038)	$ 112,280

Operating Activities

The decrease in net cash provided by operating activities was primarily driven by higher expenditures for the construction of certain projects in Japan and certain advance payments for raw materials in the current period, partially offset by higher cash receipts from module sales in the current period and higher operating expenditures in the prior period.

Investing Activities

The increase in net cash used in investing activities was primarily due to higher net purchases of marketable securities and restricted marketable securities, higher purchases of property, plant and equipment, and proceeds from the sales of our North American O&M operations and U.S. project development business in the prior period, partially offset by proceeds from the sales of our Japan project development business and certain international O&M operations in the current period.

Financing Activities

The increase in net cash provided by financing activities was primarily due to higher net borrowings under project specific debt financings for the construction of certain projects in Japan. Such project specific debt financings were assumed by PAG when we completed the sale of our Japan project development business in June 2022. The increase is also due to borrowings under the India Credit Facility in the current period for the development and construction of our first manufacturing facility in India.

Item 3. *Quantitative and Qualitative Disclosures about Market Risk*

There have been no material changes to the information previously provided under Item 7A. of our Annual Report on Form 10-K for the year ended December 31, 2021.

Item 4. *Controls and Procedures*

Evaluation of Disclosure Controls and Procedures

We carried out an evaluation, under the supervision and with the participation of management, including our Chief Executive Officer and Chief Financial Officer, of the effectiveness of our “disclosure controls and procedures” as defined in Exchange Act Rule 13a-15(e) and 15d-15(e). Based on that evaluation, our Chief Executive Officer and Chief Financial Officer concluded that as of September 30, 2022 our disclosure controls and procedures were effective to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized, and reported within the time periods specified in SEC rules and forms, and that such information is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate, to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

We also carried out an evaluation, under the supervision and with the participation of management, including our Chief Executive Officer and Chief Financial Officer, of our “internal control over financial reporting” as defined in Exchange Act Rule 13a-15(f) and 15d-15(f) to determine whether any changes in our internal control over financial reporting occurred during the three months ended September 30, 2022 that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting. Based on that evaluation, there were no such changes in our internal control over financial reporting that occurred during the three months ended September 30, 2022.

CEO and CFO Certifications

We have attached as exhibits to this Quarterly Report on Form 10-Q the certifications of our Chief Executive Officer and Chief Financial Officer, which are required in accordance with the Exchange Act. We recommend that this Item 4. be read in conjunction with those certifications for a more complete understanding of the subject matter presented.

Limitations on the Effectiveness of Controls

Control systems, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control systems' objectives are being met. Further, the design of any system of controls must reflect the fact that there are resource constraints, and the benefits of all controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within our Company have been detected. These inherent limitations include the realities that judgments in decision-making can be faulty and that breakdowns can occur because of error or mistake. Control systems can also be circumvented by the individual acts of some persons, by collusion of two or more people, or by management override of the controls. The design of any system of controls is also based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions. Over time, controls may become inadequate because of changes in conditions or deterioration in the degree of compliance with policies or procedures.

PART II. OTHER INFORMATION

Item 1. ***Legal Proceedings***

See Note 10. "Commitments and Contingencies" under the heading "Legal Proceedings" of our condensed consolidated financial statements for legal proceedings and related matters.

Item 1A. ***Risk Factors***

In addition to the other information set forth in this report, you should carefully consider the factors discussed in Item 1A. "Risk Factors" of our Annual Report on Form 10-K for the year ended December 31, 2021, which could materially affect our business, financial condition, results of operations, or cash flows. The risks described in our Annual Report on Form 10-K are not the only risks we face. Additional risks and uncertainties not currently known to us or that we currently consider immaterial may also materially adversely affect our business, financial condition, results of operations, or cash flows. Except for the risk factor set forth below, there have been no material changes in the risk factors contained in our Annual Report on Form 10-K.

The reduction, elimination, or expiration of government subsidies, economic incentives, tax incentives, renewable energy targets, and other support for on-grid solar electricity applications, or other public policies, such as tariffs or other trade remedies imposed on solar cells and modules, could negatively impact demand and/or price levels for our solar modules and limit our growth or lead to a reduction in our net sales or increase our costs, thereby adversely impacting our operating results.

Although we believe that solar energy will experience widespread adoption in those applications where it competes economically with traditional forms of energy without any support programs, in certain markets our net sales and profits remain subject to variability based on the availability and size of government subsidies and economic incentives. Federal, state, and local governmental bodies in many countries have provided subsidies in the form of feed-in-tariff structures, rebates, tax incentives, and other incentives to end users, distributors, system integrators, and manufacturers of PV solar products. Many of these support programs expire, phase out over time, require renewal by the applicable authority, or may be amended. To the extent these support programs are reduced earlier than previously expected, are changed retroactively, or are not renewed, such changes could negatively impact demand and/or price levels for our solar modules, lead to a reduction in our net sales, and adversely impact our operating results. Another consideration is the effect of governmental land-use planning policies and environmental policies on utility-scale PV solar development. The adoption of restrictive land-use designations or environmental regulations that proscribe or restrict the siting of utility-scale solar facilities could adversely affect the marginal cost of such development.

Changes or threatened changes in U.S. regulatory policy may subject us to significant risks, including the following:

- a reduction or removal of clean energy programs and initiatives and the incentives they provide may diminish the market for future solar energy off-take agreements, slow the retirement of aging fossil fuel plants, including the retirements of coal generation plants, and reduce the ability for solar project developers to compete for off-take agreements, which may reduce PV solar module sales;

- any limitations on the value or availability to manufacturers or potential investors of tax incentives that benefit solar energy production, sales, or projects, such as the Section 45X manufacturing credit, ITC, PTC, and accelerated depreciation deductions, could result in reducing such investors' economic returns, causing a reduction in the availability of affordable financing, thereby reducing demand for PV solar modules; and

- any effort to overturn federal and state laws, regulations, or policies that are supportive of solar energy generation or that remove costs or other limitations on other types of electricity generation that compete with solar energy projects could negatively impact our ability to compete with traditional forms of electricity generation and materially and adversely affect our business.

Application of U.S. trade laws, or trade laws of other countries, may also impact, either directly or indirectly, our operating results. In some instances, the application of trade laws is currently beneficial to the Company, and changes in their application could have an adverse impact.

For example, the United States currently imposes different types of tariffs and/or other trade remedies on certain imported crystalline silicon PV modules and cells from various countries. In February 2022, the U.S. President proclaimed a four-year extension of a global safeguard measure imposed pursuant to Section 201 of the Trade Act of 1974 that provides for tariffs on imported crystalline silicon solar modules and a tariff-rate quota on imported crystalline silicon solar cells. Thin film solar cell products, such as our CdTe technology, are specifically excluded from the tariffs. Moreover, the extension measure does not apply tariffs to imports of bifacial modules. The extension measure imposes a 14.75% tariff in the first year, which is scheduled to phase down annually in 0.25 percentage point increments over the four-year term. The extension measure also provides an annual tariff-rate quota, whereby tariffs apply to imported crystalline silicon solar cells above the first 5.0 GW_{DC} of imports.

In addition, the United States currently imposes antidumping and countervailing duties on certain imported crystalline silicon PV cells and modules from China and Taiwan. Such antidumping and countervailing duties can change over time pursuant to annual reviews conducted by the U.S. Department of Commerce ("USDOC"), and a decline in duty rates and USDOC refusals to fully enforce U.S. antidumping and countervailing duty laws could have an adverse impact on our operating results. In March 2022, USDOC initiated inquiries concerning alleged circumvention of antidumping and countervailing duties on Chinese imports by crystalline silicon PV cells and module imports assembled and completed in Cambodia, Malaysia, Thailand, and Vietnam. In June 2022, the U.S. President declared an emergency with respect to threats to electricity generation capacity and authorized the U.S. Secretary of Commerce to consider permitting the importation of crystalline silicon PV products from those four countries free of antidumping and countervailing duties for 24 months, or until the emergency has terminated. USDOC has issued regulations implementing that moratorium on antidumping and countervailing duties in the event that it finds circumvention with respect to crystalline silicon PV products assembled and completed in those four countries. USDOC's preliminary determinations concerning alleged circumvention with respect to those four countries are due to be announced on November 29, 2022. We cannot predict what further actions USDOC will take with respect to these circumvention inquiries. Our operating results could be adversely impacted if USDOC makes negative circumvention determinations or refrains from imposing antidumping and countervailing duties on imports covered by affirmative circumvention determinations. Conversely, affirmative circumvention determinations could positively impact our operating results.

Moreover, the United States currently imposes tariffs on various articles imported from China at a rate of 25%, including crystalline silicon solar cells and modules, based on an investigation under Section 301 of the Trade Act of

1974. In May 2022, the Office of the United States Trade Representative initiated a statutory four-year review of those tariff actions, which could result in the termination or modification of the tariffs. The review remains pending, and we cannot predict its outcome. Our operating results could be adversely impacted if the review results in a termination or reduction in tariffs on crystalline silicon solar cells and modules from China.

In other instances, the application of U.S. trade laws has had, or could have, an adverse impact on our operating results by increasing our costs or limiting the competitiveness of our products. For example, the United States imposes tariffs on certain imported aluminum and steel articles from certain foreign jurisdictions, generally at rates of 10% and 25%, respectively, under Section 232 of the Trade Expansion Act of 1962. Such tariffs and policies, or any other U.S. or global trade remedies or other trade barriers, may directly or indirectly affect U.S. or global markets for solar energy and our business, financial condition, and results of operations. These examples show that established markets for PV solar development face uncertainties arising from policy, regulatory, and governmental constraints. While the expected potential of the markets we are targeting is significant, policy promulgation and market development are especially vulnerable to governmental inertia, political instability, the imposition or lowering of trade remedies and other trade barriers, geopolitical risk, fossil fuel subsidization, potentially stringent localization requirements, and limited available infrastructure.

Item 6. *Exhibits*

The following exhibits are filed with this Quarterly Report on Form 10-Q:

Exhibit Number	Exhibit Description
3.1	Amended and Restated Certificate of Incorporation of First Solar, Inc. (incorporated by reference to Exhibit 3.1 to First Solar, Inc.'s Registration Statement on Form S-1 filed on October 25, 2006)
3.2	Amended and Restated Bylaws of First Solar, Inc. (incorporated by reference to Exhibit 3.1 to First Solar, Inc.'s Form 8-K filed on July 23, 2021)
10.1*+§	Guaranty Agreement, dated August 4, 2022, between First Solar, Inc. and United States International Development Finance Corporation
31.1*	Certification of Chief Executive Officer pursuant to 15 U.S.C. Section 7241, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2*	Certification of Chief Financial Officer pursuant to 15 U.S.C. Section 7241, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1†	Certification of Chief Executive Officer and Chief Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101.INS	XBRL Instance Document – the instance document does not appear in the Interactive Data file because its XBRL tags are embedded within the Inline XBRL document
101.SCH	XBRL Taxonomy Extension Schema Document
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	XBRL Taxonomy Label Linkbase Document
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document
104	Cover page formatted as Inline XBRL and contained in Exhibit 101

* Filed herewith.

\+ Portions of this exhibit have been redacted in compliance with Item 601(b)(10) of Regulation S-K.

§ Exhibits and schedules have been omitted pursuant to Item 601(a)(5) of Regulation S-K.

† Furnished herewith. This exhibit shall not be deemed "filed" for purposes of Section 18 of the Exchange Act or otherwise subject to the liabilities of that section, nor shall it be deemed incorporated by reference in any filing under the Securities Act or the Exchange Act, whether made before or after the date hereof and irrespective of any general incorporation language in such filings.

SIGNATURE

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

	FIRST SOLAR, INC.	
Date: October 27, 2022	By:	/s/ BYRON JEFFERS
	Name:	Byron Jeffers
	Title:	Chief Accounting Officer

EXHIBIT 10.1
EXECUTION VERSION

CERTAIN IDENTIFIED INFORMATION HAS BEEN EXCLUDED FROM THE EXHIBIT BECAUSE IT IS BOTH NOT MATERIAL AND IS THE TYPE THAT THE REGISTRANT TREATS AS PRIVATE OR CONFIDENTIAL. REDACTED INFORMATION IS INDICATED BY [***].

GUARANTY AGREEMENT

by

FIRST SOLAR, INC.

in favor of

UNITED STATES INTERNATIONAL DEVELOPMENT FINANCE CORPORATION

Dated as of August 4, 2022

DFC/9000115523

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GUARANTY AGREEMENT

This **GUARANTY AGREEMENT** (this "***Guaranty Agreement***"), dated as of August 4, 2022, is made by **FIRST SOLAR, INC.**, a Delaware corporation (the "***Guarantor***"), in favor of the **UNITED STATES INTERNATIONAL DEVELOPMENT FINANCE CORPORATION**, an agency of the United States of America ("***DFC***").

R E C I T A L S:

WHEREAS, FS India Solar Ventures Private Limited, a private limited company organized and existing under the laws of the Republic of India with CIN U29308DL2020FTC371690 (the "***Borrower***"), and DFC have entered into that certain Finance Agreement, dated as of July 27, 2022 (as hereafter amended or otherwise modified from time to time, the "***Finance Agreement***");

WHEREAS, the Guarantor is the indirect owner of one hundred percent (100%) of the authorized and issued share capital of the Borrower and will derive substantial direct and indirect benefit from the transactions contemplated by the Finance Agreement; and

WHEREAS, it is a condition precedent to DFC's obligation to provide the Loan in accordance with the terms of the Finance Agreement that the Guarantor shall have executed and delivered this Guaranty Agreement, which the Guarantor has agreed to do to induce DFC to provide the Loan.

NOW, **THEREFORE**, in consideration of the premises and of the agreements contained herein and for good and valuable consideration the sufficiency of which is acknowledged, it is hereby agreed and promised as follows:

Section 1. Definitions; Interpretation.

(a) In this Guaranty Agreement, including the Schedules hereto, capitalized terms used herein and not otherwise defined herein have the respective meanings set forth in the Finance Agreement, and the following terms shall have the following meanings:

"***Borrower***" has the meaning set forth in the recitals.

"***Consolidated***" or "***Consolidated Basis***" means, with respect to any Financial Statements to be provided, or any financial calculation to be made, that calculation shall be made by reference to the sum of all amounts of similar nature reported in the relevant Financial Statements of each of the entities whose accounts are to be consolidated with the accounts of the Guarantor plus or minus the consolidation adjustments customarily applied to avoid double counting of transactions among any of those entities, including the Guarantor; and the entities whose accounts are to be consolidated with the accounts of the Guarantor.

"***Consolidated EBITDA***" means, for any period, Consolidated Net Income for such period plus, without duplication and to the extent deducted in determining Consolidated Net Income for such period, the sum of (a) interest expense, (b) provision for taxes based on income, (c) depreciation expense, (d) amortization expense, (e) extraordinary, unusual or non-recurring charges, expenses or losses (including, whether or not otherwise includable as a separate item in the statement of such Consolidated Net Income for such period, losses on sales of assets outside of the ordinary course of business exceeding [***] and (f) other non-cash charges, expenses or losses (excluding any such non-cash charge to the extent it represents an accrual or reserve for potential cash charge in any future period or amortization of a prepaid cash charge that was paid in a prior period), minus, to the extent included in determining Consolidated Net Income for such period, the sum of (i) extraordinary, unusual or non-recurring gains and non-cash income, (including, whether or not otherwise includable as a separate item in the statement of such Consolidated Net Income for such period, gains on sales of assets outside of the ordinary course of business exceeding [***] (ii) any other non-cash income or gains increasing Consolidated Net Income for such period (excluding any such non-cash gain to the extent it represents the reversal of an accrual or reserve for potential cash charge in any prior period) and (iii) any gains realized from the disposition of property outside of the ordinary course of business, all as determined on a Consolidated Basis. For the purpose of calculating Consolidated EBITDA for any period, if during such period the Guarantor or any Subsidiary shall have consummated an acquisition or disposition of the Equity Interests of a Subsidiary, Consolidated EBITDA for such period shall be calculated after giving pro forma effect thereto as if such acquisition or disposition occurred on the first day of such period.

"***Consolidated Leverage Ratio***" means, as of any date of determination, the ratio of (a) Consolidated Total Debt as of such date to (b) Consolidated EBITDA for the period of the four fiscal quarters most recently ended.

"***Consolidated Net Income***" means, for any period, the Consolidated net income (or loss) of the Guarantor and its Subsidiaries on a Consolidated Basis; provided that there shall be excluded (a) the income (or deficit) of any Person accrued prior to the date it becomes a Subsidiary of the Guarantor or is merged into or consolidated with the Guarantor or any of its Subsidiaries, (b) the income (or deficit) of any Person (other than a Subsidiary of the Guarantor) in which the Guarantor or any of its Subsidiaries has an ownership interest, except to the extent that any such income is actually received by the Guarantor or such Subsidiary in the form of dividends or similar distributions and (c) the undistributed earnings of any Subsidiary of the Guarantor to the extent that the declaration or payment of dividends or similar distributions by such Subsidiary is not at the time permitted by the terms of any Contractual Obligation (other than under any Financing Document) or requirement of any Applicable Law applicable to such Subsidiary.

"***Consolidated Tangible Net Worth***" means, as of any date of determination, for the Guarantor and its Subsidiaries on a Consolidated Basis, Shareholders' Equity of the Guarantor and its Subsidiaries on such date minus the Intangible Assets of the Guarantor and its Subsidiaries on such date.

"***Consolidated Total Debt***" means, as of any date of determination, the aggregate stated balance sheet amount of all Indebtedness of the Guarantor and its Subsidiaries (or, if higher, the par value or stated face amount of all such Indebtedness (other than zero coupon Indebtedness)) on a Consolidated Basis on such date.

“***Contractual Obligation***” means, as to any Person, any provision of any security issued by such Person or of any agreement, instrument or other undertaking to which such Person is a party or by which it or any of its property is bound.

“***Current Assets***” means the Consolidated assets of the Guarantor treated as current assets under GAAP.

“***Current Liabilities***” means the Consolidated liabilities of the Guarantor treated as current liabilities under GAAP (other than any Non-Recourse Project Financing and other than Indebtedness under the Luz del Norte Financing).

“***Current Ratio***” means, as of any date of determination, the ratio, expressed as a percentage, obtained by dividing (a) Current Assets (minus prepaid expenses) as of such date, by (b) Current Liabilities as of such date.

“***DFC***” has the meaning set forth in the preamble.

“***Equity Interests***” means, as to any Person, all of the shares of capital stock of (or other ownership or profit interests in) such Person, all of the warrants, options or other rights for the purchase or acquisition from such Person of shares of capital stock of (or other ownership or profit interests in) such Person, all of the securities convertible into or exchangeable for shares of capital stock of (or other ownership or profit interests in) such Person or warrants, rights or options for the purchase or acquisition from such Person of such shares (or such other interests), and all of the other ownership or profit interests in such Person (including partnership, member or trust interests therein), whether voting or nonvoting, and whether or not such shares, warrants, options, rights or other interests are outstanding on any date of determination.

“***Excluded Liens***” means:

(a) tax, mechanic’s, worker’s or other like Liens arising by mandatory provision of law securing obligations incurred in the ordinary course of business that are (i) not yet overdue or (ii) that are being contested or litigated in good faith and for which adequate reserves have been made in accordance with GAAP;

(b) Liens, pledges or deposits under worker’s compensation, unemployment insurance or other social security legislation;

(c) easements, rights-of-way, restrictions and other similar Liens incurred in the ordinary course of business and encumbrances consisting of zoning restrictions, licenses, or similar restrictions on the use of property or minor imperfections in title that could not reasonably be expected to have a Material Adverse Effect;

(d) Liens securing bank guarantees and letters of credit, in an aggregate amount not to exceed [***] (including any extension, renewal or refinancing of such Indebtedness pursuant to clause (e) below), or, if greater than such amount, subject to restrictions and conditions acceptable to DFC;

(e) any Lien securing an extension, renewal or refinancing of the original Indebtedness secured by the Liens in clause (d) above; provided that (x) such Lien is created over the assets that secured such Indebtedness and (y) the principal amount of Indebtedness secured by the Lien prior to such extension, renewal or refinancing does not increase; and

(f) Liens securing amounts payable to suppliers of goods or services incurred in the ordinary course of business; provided that such Liens are created over the goods supplied or the assets serviced, as applicable.

"***Finance Agreement***" has the meaning set forth in the recitals.

"***Guarantor***" has the meaning set forth in the preamble.

"***Guaranty Agreement***" has the meaning set forth in the preamble.

"***Guarantor Indemnity***" has the meaning set forth in Section 22.

"***Indebtedness***" means, with respect to a Person, without duplication (i) all obligations of such Person for borrowed money; (ii) all obligations of such Person evidenced by bonds, debentures, notes or similar instruments; (iii) all obligations of such Person upon which interest charges are customarily paid; (iv) all obligations of such Person under conditional sale or other title-retention agreements relating to property acquired by such Person; (v) all obligations of such Person in respect of the deferred purchase price of property or services [***]; (vi) all Indebtedness of others secured by (or for which the holder of such Indebtedness has an existing right, contingent or otherwise, to be secured by) any Lien on property owned or acquired by such Person, whether or not the Indebtedness secured thereby has been assumed; (vii) all Guarantees by such Person of Indebtedness of others (solely to the extent that such Indebtedness is not already covered in this definition); (viii) all obligations of such Person under any lease of property, real or personal, the obligations of the lessee in respect of which are required in accordance with GAAP to be capitalized on the balance sheet of the lessee; (ix) [***]; (x) the amount of all letters of credit issued for the account of such Person and, without duplication, all outstanding reimbursement obligations with respect thereto; and (xi) all obligations of such Person, contingent or otherwise, under trade or bankers' acceptances. The Indebtedness of Guarantor shall include the Indebtedness of any other entity (including any partnership in which such Person is a general partner) to the extent such Person is liable therefor as a result of such Person's ownership interest in or other relationship with such entity, except to the extent the terms of such Indebtedness provide that such Person is not liable therefor.

"***Intangible Assets***" means intangible assets under GAAP, including customer lists, goodwill, copyrights, trade names, trademarks, patents, franchises, licenses, unamortized deferred charges, unamortized debt discount and capitalized research and development costs.

"***Obligations***" has the meaning set forth in Section 2.

"***Proceeding***" has the meaning set forth in Section 22.

"***Shareholders' Equity***" means, as of any date of determination, Consolidated shareholders' equity of the Guarantor and its Subsidiaries as of such date determined in accordance with GAAP.

(b) The rules of interpretation set forth in Schedule X of the Finance Agreement shall apply to this Guaranty Agreement *mutatis mutandis* as if set forth in full in this Section 1(b).

Section 2. Guaranty.

The Guarantor hereby unconditionally and irrevocably guarantees, as primary obligor and not merely as a surety, the full and punctual payment when due no later than ten (10) Business Days after receipt of written notice of demand of payment from DFC, whether at stated maturity, by acceleration or otherwise, of all obligations of the Borrower now or hereafter existing under the Finance Agreement, the Note, and all other Financing Documents, whether for payment of principal, interest, fees, expenses, or otherwise, including all or any portion of such indebtedness, liabilities and obligations that are paid, to the extent all or any part of such payment is avoided or recovered directly from fraudulent transfer or otherwise (such obligations being the "***Obligations***").

Section 3. Guaranty Absolute.

(a) The obligations of the Guarantor under this Guaranty Agreement are independent of the Obligations, and a separate action or actions may be brought and prosecuted against the Guarantor to enforce this Guaranty Agreement, irrespective of whether any action is brought against the Borrower or whether the Borrower is joined in any such action or actions. All rights of DFC and the obligations of the Guarantor under this Guaranty Agreement shall be direct, absolute, unconditional, irrevocable, and continuing and shall not to any extent or in any way be reduced, limited, terminated, discharged, impaired, or otherwise affected by any of the following:

(i) the Borrower's failure to pay a fee or provide other consideration to the Guarantor in consideration of its entering into this Guaranty Agreement;

(ii) the occurrence or continuation of any Default or Event of Default or any acceleration or required prepayment of the Obligations as a result thereof of otherwise;

(iii) any illegality, lack of validity or unenforceability of, or any misrepresentation, irregularity, or other defect in, the Finance Agreement, the Note, any other Financing Document, or any other guaranty, agreement, or instrument relating thereto;

(iv) any failure by DFC to take any steps to preserve its rights to any Lien securing the Loan, or any failure by DFC to perfect or keep perfected its Liens in any collateral relating to the Loan, the Finance Agreement or the Notes;

(v) any failure to pay Taxes that may have been payable in respect of the issuance or transfer of the Note or to register the same with any Governmental Authority or to obtain any governmental order, license, or permit in connection with such issuance or transfer;

(vi) any change in the time, manner, or place of payment of, or in any other term of, all or any of the Obligations, or any other modification or amendment of (whether material or otherwise), or waiver, or consent to any departure from, or any other action taken or failure to take action with respect to, the Finance Agreement, the Note, or any other Financing Document or any other agreement or document delivered pursuant to the terms of any Financing Document, including any forbearance, indulgence in, or extension of time for payment by the Borrower of any amount payable under or in connection with the Finance Agreement or the Note or for the performance of any of the other Obligations (any of which modifications, amendments, waivers, or consents may be agreed to or granted without the approval or consent of the Guarantor), or any increase in the Obligations resulting from the extension of additional credit to the Borrower or otherwise;

(vii) any taking, exchange, release, or non-perfection of any collateral, or any taking, release, or amendment or waiver of, or consent to departure from, any other guaranty for all or any of the Obligations;

(viii) any manner of application of collateral, or proceeds thereof, to all or any of the Obligations, or any manner of voluntary or involuntary liquidation, sale, or other disposition of any collateral for all or any of the Obligations or any other assets of the Borrower or any other Person, or the receivership, insolvency, bankruptcy, reorganization, or similar proceedings affecting the Borrower or its assets or the release or discharge of the Borrower from any of the Obligations;

(ix) any law regulation, decree, or judgment now or hereafter in effect that may in any manner affect the payment of any of the Obligations or any of DFC's rights under the Financing Documents, whether or not the Borrower has a valid defense against DFC and whether or not any other guarantor contributes to such payments;

(x) any change, consolidation, merger, other restructuring, or termination of the corporate structure or existence of the Borrower, the Guarantor, any other guarantor of the Obligations, or any other party;

(xi) the recovery of any judgment against the Guarantor or any action to enforce the same or the insolvency or bankruptcy of the Guarantor, or any discharge, stay, injunction, or modification of the obligations of the Guarantor in relation to the insolvency or bankruptcy of the Guarantor;

(xii) any change of circumstances, whether or not foreseeable, and whether or not any such change does or might vary the Obligations or the risk or obligations of the Guarantor hereunder;

(xiii) any other circumstance, whether similar or dissimilar to the foregoing, that might otherwise constitute a defense available to, or a legal or equitable discharge of, the Borrower, the Guarantor, or any other guarantor or surety, other than payment in full of the Obligations.

(b) This Guaranty Agreement is a guaranty of payment and not of collection. DFC may require payment by the Guarantor and enforce the obligations of the Guarantor hereunder without first being required to:

(i) make any demand of, or make any effort of collection of any obligation of, or enforce DFC's claims against, the Borrower, the Guarantor, or any other Person other than as set forth in Section 2; provided, that no such demand, effort of collection or enforcement of DFC's claims shall be required to the extent DFC is precluded from doing so under Applicable Law; or

(ii) resort to any security or other guaranty of the Loan or this Guaranty Agreement; or

(iii) take any other action prior to receiving payment hereunder.

(c) Without limiting the generality of any other provision hereof, the Guarantor's liability hereunder shall extend to all amounts that constitute part of the Obligations and are owed by the Borrower under the Financing Documents.

(d) Notwithstanding anything to the contrary in this Guaranty Agreement and without limiting the generality of any other provision hereof, the Guarantor agrees that DFC may, at any time and from time to time, either before or after the maturity of the Loan, without notice to or further consent of the Guarantor, extend the time of payment of, exchange, or surrender any collateral for, or renew the Loan, and that DFC may also make any agreement with the Borrower or with any other party to or Person liable on the Loan or interested therein, for the extension, renewal, payment, compromise, discharge, release, or settlement of the terms thereof, in whole or in part, or for any modification, waiver, discharge, release or settlement of the terms thereof or of any agreement between DFC, the Borrower, any guarantor (including this Guaranty Agreement), or any other party or Person, without in any way impairing or affecting the obligations and liabilities of the Guarantor under this Guaranty Agreement or requiring the written agreement or consent of the Borrower or the Guarantor, as the case may be.

Section 4. Waiver.

The Guarantor unconditionally waives promptness, presentment, demand, set-off, diligence, filing of claims with a court in the event of insolvency or bankruptcy of the Borrower, or otherwise, and any right to require a proceeding first against the Borrower or the Guarantor, and waives protest, notice (including notice of a Default or Event of Default of the Borrower, notice of acceptance of this Guaranty Agreement, notice of collateral received or delivered, and notice of any other action taken in reliance hereon), all demands and notices in connection with the delivery, acceptance, performance, default, or enforcement of any of the Obligations, all notices of the existence, creation, or incurring of any Indebtedness by the Borrower under the Financing Documents, all other demands and notices of any description (in each case, except as expressly set forth herein), and any requirement that DFC protect, secure, perfect, or insure any Lien or any property subject thereto or exhaust any right or take any action against the Borrower or any other Person or any collateral. The Guarantor hereby assents to any extension or postponement of the time of payment or any other indulgence, to any substitution, exchange, or release of collateral, and to the addition or release of any Person primarily or secondarily liable. The Guarantor unconditionally agrees that its guaranty hereunder will not be discharged except by complete performance of the obligations contemplated under Section 2 and payment in full in Dollars in New York of all amounts due and to become due under the Finance Agreement and/or the Notes in accordance with the Fedwire transfer and/or international electronic funds transfer instructions set forth in Schedule 2.08(b) to the Finance Agreement. The Guarantor also waives all notices of the existence, creation, or incurring of any new or additional Indebtedness by the Borrower under the Financing Documents.

Section 5. Reinstatement of Guaranty.

The obligations of the Guarantor pursuant to this Guaranty Agreement shall remain in full force and effect or shall be reinstated, as the case may be, if and to the extent that at any time any payment of any of the Obligations is rescinded, avoided, or must otherwise be returned or repaid by DFC, in whole or in part, upon the insolvency, bankruptcy, or reorganization of the Borrower or otherwise, as if such payment had not been made by the Borrower.

Section 6. Tax Gross-Up.

(a) All sums payable by the Guarantor hereunder shall be paid in full, free of any deductions or withholdings of any and all present and future Taxes, unless required by Applicable Law. If the Guarantor is required by Applicable Law to deduct any Taxes from, or to withhold any Taxes in respect of, any amount payable to DFC hereunder, then the Guarantor shall pay such additional amount as may be necessary so that the actual amount received by DFC after such deductions or withholdings equals the full amount stated to be payable hereunder.

(b) The Guarantor shall pay, before they become overdue, any and all present and future Taxes payable on or in connection with the execution, delivery, registration, or notarization, or for the legality, validity, or enforceability of this Guaranty Agreement directly to the Governmental Authority responsible for collecting such Taxes, except for any Taxes that the Guarantor is contesting in good faith by appropriate proceedings and for which adequate reserves have been set aside in accordance with GAAP; *provided*, that the Guarantor hereby indemnifies DFC and holds DFC harmless from and against any and all liabilities, fees, or additional expenses with respect to or resulting from any delay in paying, or omission to pay, any such Taxes. Within thirty (30) days after payment by the Guarantor of any such Taxes, the Guarantor shall deliver to DFC the original or a Certified copy of the receipt evidencing payment thereof, together with any other information DFC may reasonably request. DFC shall have the right, but not the obligation, to pay any Taxes required to be paid by the Guarantor pursuant to this Section 6(b) and not timely paid by the Guarantor, and the Guarantor shall, upon DFC's demand, promptly within thirty (30) days reimburse DFC in full for all such payments.

Section 7. Representations and Warranties.

The Guarantor represents and warrants to DFC, as of the date hereof and as of each Closing Date (unless otherwise specified), that:

(a) The Guarantor (i) is a corporation, duly organized, validly existing, and in good standing under the laws of the jurisdiction of its organization, (ii) is duly authorized to do business in each jurisdiction in which it conducts business, and (iii) has the power to own its properties, and carry on its business, [***].

(b) The Guarantor's execution, delivery and performance of this Guaranty Agreement (i) have been duly authorized by all necessary corporate action; (ii) will not violate any Applicable Law [***]; and (iii) will not breach any of its Charter Documents, any Consent or any agreement by which it or any of its properties may be bound or affected, [***].

(c) This Guaranty Agreement has been duly executed and delivered by the Guarantor and is a legal, valid, and binding obligation of the Guarantor enforceable in accordance with its terms (except, in any case, as such enforceability may be limited by applicable bankruptcy, insolvency, [***], reorganization, [***], or other similar laws affecting creditors' rights generally and general equitable principles regardless of whether the issue of enforceability is considered in a proceeding in equity or at law).

(d) The Guarantor indirectly owns one hundred percent (100%) of the issued and outstanding equity interests of the Borrower, and the Guarantor acknowledges that it will receive substantial direct and indirect benefits from the financing arrangements contemplated by the Financing Documents and that the arrangements set forth in this Guaranty Agreement are knowingly made in contemplation of such benefits.

(e) The Guarantor is a "recognized lender" under the ECB Guidelines. No Consent of any Governmental Authority or any other Person is required in connection with the Guarantor's execution, delivery, performance, validity or enforceability of this Guaranty Agreement, except for the no-objection of the AD Bank of the Borrower under the ECB Guidelines, which no-objection has already been obtained.

(f) Neither the Guarantor nor any of its properties or revenues has any right of immunity from suit, court jurisdiction, attachment prior to judgment, attachment in aid of execution of a judgment, set-off, execution of a judgment or from any other legal process with respect to its obligations under this Guaranty Agreement.

(g) (i) As of the date hereof, the Guarantor's (A) audited Financial Statements prepared in accordance with GAAP, together with a certificate by the chief financial officer or treasurer of the Guarantor as being true and correct for the year ended December 31, 2021, and (B) quarterly unaudited Financial Statements prepared in accordance with GAAP, certified by the chief financial officer or treasurer of the Guarantor as being true and correct for the quarter ended March 31, 2022, each delivered by the Guarantor to DFC, and (ii) as of each Closing Date, the most recent quarterly Financial Statements or annual Financial Statements delivered to DFC pursuant Section 8(c) or (d), in each case of the foregoing clauses (i) and (ii) are complete and correct and fairly present [***] the Guarantor's financial condition and the results of its operations for the periods then ended. [***].

(h) Except (1) for obligations and losses incurred in the ordinary course of business, (2) obligations secured by Excluded Liens arising after the end of the period of the most recent Financial Statements referenced in clause (g) above, and (3) obligations not secured by Excluded Liens that are permitted by the Finance Agreement and this Guaranty Agreement, the Guarantor has no material obligation, contingent or otherwise, or material loss, [***].

(i) Each representation and warranty made by the Borrower in respect of the Guarantor to DFC in the Financing Documents is true and correct.

(j) No action, suit, other legal or arbitral proceeding, or investigation is pending by or before any domestic or foreign court or Governmental Authority or in any arbitral or other forum, or, [***], is threatened, that (i) relates to any of the transactions contemplated by this Guaranty Agreement or any other Financing Document, or (ii) could reasonably be expected to have a Material Adverse Effect.

(k) The Guarantor has, independently and without reliance upon the representations of DFC or any other Person and based on such documents and information as it has deemed appropriate, made its own credit analysis and decision to enter into this Guaranty Agreement.

(l) The Guarantor makes the representations and warranties set out in Part B of Schedule Z (*DFC Statutory and Policy Requirements*) to the Finance Agreement.

(m) As of the date hereof, as of each Closing Date and immediately after giving effect to the transactions contemplated to occur on each Closing Date, (i) the fair value of the aggregate assets of the Guarantor, at a fair valuation, will exceed the debts and liabilities, direct, subordinated, contingent or otherwise, of the Guarantor, (ii) the present fair value of the property of the Guarantor will be greater than the amount that will be required to pay the probable liability of the Guarantor, on its debts and other liabilities, direct, subordinated, contingent or otherwise, as such debts and other liabilities become absolute and matured, (iii) the Guarantor will be able to pay its respective debts and liabilities, direct, subordinated, contingent or otherwise, as such debts and liabilities become absolute and matured (after giving effect to any guarantees and credit support), and (iv) the Guarantor will not have unreasonably small capital with which to conduct the business in which it is engaged as such business is now conducted and is proposed to be conducted following each Closing Date.

(n) The Guarantor is not required to register as an "investment company" under the Investment Company Act of 1940, 15 U.S.C. § 80a-2, as amended.

Section 8. Covenants.

Unless DFC otherwise agrees in writing, so long as any of the Obligations remain unpaid in full in Dollars in New York, the Guarantor agrees as follows:

(a) The Guarantor shall promptly notify DFC of each event that constitutes a Default or an Event of Default, and of the occurrence of any other condition or event that individually or in the aggregate could reasonably be expected to have a Material Adverse Effect (including any action by any Governmental Authority), and any steps the Guarantor is taking to remedy such condition or event.

(b) The Guarantor shall permit any representatives of DFC, upon reasonable prior notice, to visit and inspect its properties, to examine and make extracts from its books and records, and to discuss its affairs, finances, and condition with its officers and independent accountants, all at such reasonable times and as often as reasonably requested.

(c) Within [***] after the end of each fiscal quarter (including the fourth fiscal quarter) of each Fiscal Year, the Guarantor shall deliver to DFC (i) the Guarantor's Consolidated quarterly unaudited Financial Statements for such fiscal quarter, prepared in or translated into English and in U.S. dollars in accordance with GAAP, (ii) a Certified comparison of such Financial Statements to the quarterly Financial Statements for the same period in the previous Fiscal Year, and (iii) a certificate of the Guarantor's chief financial officer or treasurer substantially in the form of Exhibit E (*Form of Compliance Certificate*) to the Finance Agreement demonstrating in reasonable detail the Guarantor's compliance with the financial covenants set forth in Section 8(e) and the basis for such calculations.

(d) Within [***] after the end of each Fiscal Year, the Guarantor shall deliver to DFC (i) the Guarantor's audited Consolidated Financial Statements for such Fiscal Year, (ii) a Certified comparison of such Financial Statements to the annual audited Financial Statements for the previous fiscal year, and (iii) a certificate of the Guarantor's chief financial officer or treasurer substantially in the form of Exhibit E (*Form of Compliance Certificate*) to the Finance Agreement demonstrating in reasonable detail the Guarantor's compliance with the financial covenants set forth in Section 8(e) and the basis for such calculations.

(e) The Guarantor shall maintain:

(i) at all times and on a Consolidated Basis, a Consolidated Leverage Ratio of [***];

(ii) at all times and on a Consolidated Basis, a Consolidated Tangible Net Worth of [***]; and

(iii) at all times and on a Consolidated Basis, a Current Ratio of [***].

(f) The Guarantor shall effect and maintain Hedges, if any, in accordance with the Hedging Policy.

(g) The Guarantor shall notify DFC promptly (and in any case within five (5) Business Days) of the commencement of any legal or arbitral proceedings against the Guarantor involving claims that are material and relate to any of the transactions contemplated by any Financing Document.

(h) The Guarantor shall comply with the covenants set out in Part D (*Covenants*) of Schedule Z (*DFC Statutory and Policy Requirements*) of the Finance Agreement to the extent applicable to the Guarantor.

(i) The Guarantor shall furnish to DFC from time to time such other information and data with respect to the Guarantor's ability to perform its obligations under this Guaranty Agreement as DFC may reasonably request.

(j) The Guarantor shall take all actions as may be necessary to ensure that the payment obligations of the Guarantor hereunder at all times constitute unsubordinated general obligations of the Guarantor ranking at least *pari passu* in priority of payment and, except for Excluded Liens, priority of security with all other present and future Indebtedness of the Guarantor.

Section 9. Currency and Place of Payment.

All payments to DFC shall be made in Dollars by wire transfer in immediately available funds without counterclaim, offset, or deduction. Unless instructed otherwise by DFC, wires should be sent to DFC's account with the U.S. Treasury Department in New York by either Fedwire transfer or international electronic funds transfer, and any such wire must include the required information set forth in Schedule 1 (*Wire Instructions for Remittance of Payments to DFC*).

Section 10. Remedies; No Waiver.

(a) DFC may proceed to protect and enforce its rights hereunder in any court or other tribunal by an action at law, suit in equity, or other appropriate proceedings, whether for damages, for the specific performance of any term hereof, or otherwise, or in aid of the exercise of any power granted hereby or by law. The Guarantor agrees to pay to DFC on demand such amount in Dollars as shall be sufficient to cover DFC's reasonable and documented out-of-pocket costs and expenses of any action or such remedies, including attorneys' fees, expenses, and disbursements.

(b) No failure or delay by DFC in exercising any right, power or remedy shall operate as a waiver thereof or otherwise impair any of its rights, powers, or remedies. No single or partial exercise of any such right shall preclude any other or further exercise thereof or the exercise of any other legal right. No waiver of any such right shall be effective unless given in writing.

(c) The rights or remedies provided for herein are cumulative and are not exclusive of any other rights, powers, or remedies provided by law. The assertion or employment of any right or remedy hereunder, or otherwise, shall not prevent the concurrent assertion of any other appropriate right or remedy.

Section 11. Jurisdiction and Consent to Suit.

The Guarantor hereby irrevocably and unconditionally:

(a) submits for itself and its property in any legal action or proceeding relating to this Guaranty Agreement or any other Financing Document, or for recognition and enforcement of any judgment in respect thereof, to the non-exclusive general jurisdiction of the courts of the State of New York sitting in the County of New York, the courts of the United States of America for the Southern District of New York, and the courts of any other jurisdiction where it or any of its property may be found and appellate courts from any thereof;

(b) consents that any such action or proceeding may be brought in such courts and waives any objection that it may now or hereafter have to the venue of any such action or proceeding in any such court or that such action or proceeding was brought in an inconvenient court and agrees not to plead or claim the same;

(c) agrees that nothing herein shall affect the right to effect service of process in any other manner permitted by Applicable Law or shall limit the right to sue in any other jurisdiction; and

(d) agrees that judgment against it in any such action or proceeding shall be conclusive and may be enforced in any other jurisdiction by suit on the judgment or otherwise as provided by law, a Certified or exemplified copy of which judgment shall be conclusive evidence of the fact and amount of the Guarantor's obligation.

Section 12. Succession; Assignment.

This Guaranty Agreement shall inure to the benefit of and be binding upon the successors and permitted assigns of the parties hereto; *provided, however,* that the Guarantor shall not, without the prior written consent of DFC, assign or delegate all or any part of its interest herein or obligations hereunder.

Section 13. Benefits of Guaranty.

Nothing in this Guaranty Agreement, express or implied, shall give to any Person, other than the parties hereto and their successors and permitted assigns hereunder and under the Finance Agreement, any benefit or any legal or equitable right or remedy under this Guaranty Agreement.

Section 14. Notices.

(a) Except as otherwise provided herein, each notice, demand, or other communication relating to this Guaranty Agreement shall be in writing and shall be delivered by hand or overnight courier service, or delivered by e-mail as follows:

To the Guarantor:

First Solar, Inc.
350 West Washington Street, Suite 600
Tempe, AZ 85281
Attn.: General Counsel
E-mail: generalcounsel@firstsolar.com

with a copy (which shall not constitute notice) to:

First Solar, Inc.
350 West Washington Street, Suite 600
Tempe, AZ 85281
Attention: Treasurer
Email: TreasuryGlobal @firstsolar.com

To DFC:

United States International Development Finance Corporation
1100 New York Avenue, N.W.
Washington, D.C. 20527
United States of America
Attn.: Vice President, Structured Finance & Insurance
And attn.: Managing Director, Project Portfolio Management Division
E-mail: notices@dfc.gov
Re: DFC Loan No. 9000115523

(b) Notices, demands or other communications sent by hand or overnight courier services, shall be deemed to have been duly given when sent. Notices, demands or other communications delivered through electronic communications to the extent provided in Section 14(c), shall be deemed to have been given as provided therein. Any party hereto may change its address for notices, demands and other communications hereunder by notice to the other parties hereto. No notice, demand or other communication to DFC shall be effective unless such notice, demand or other communication includes FS India Solar Ventures Private Limited (India), Project Number: 9000115523, and, prior to the first Disbursement, attention to Vice President, Structured Finance & Insurance, subsequent to the initial Closing Date, attention to Managing Director, Project Portfolio Management Division.

(c) Notices, demands and other communications sent to the e-mail address of the addressee set forth in Section 14(a) shall be deemed to have been given upon the sender's receipt of an acknowledgement from the intended recipient (such as by the "return receipt requested" function (as available, but excluding any automatic answer-back), return or reply e-mail or other written acknowledgement).

Section 15. English Language.

All documents to be delivered or communications made under this Guaranty Agreement shall be in English or, if in another language, shall be accompanied by a Certified translation into English, which translation shall govern between the parties hereto.

Section 16. Governing Law.

THIS GUARANTY AGREEMENT AND ANY CLAIM, CONTROVERSY, DISPUTE, OR CAUSE OF ACTION (WHETHER IN CONTRACT, TORT OR OTHERWISE) BASED UPON, ARISING OUT OF OR RELATING TO THIS GUARANTY AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF NEW YORK, UNITED STATES OF AMERICA, WITHOUT REGARD TO CONFLICT OF LAW PRINCIPLES THAT WOULD OTHERWISE DIRECT APPLICATION OF THE LAW OF ANOTHER JURISDICTION.

Section 17. Waiver of Jury Trial.

THE GUARANTOR AND DFC EACH IRREVOCABLY WAIVES, TO THE FULLEST EXTENT PERMITTED BY LAW, ANY RIGHT TO HAVE A JURY PARTICIPATE IN RESOLVING ANY DISPUTE ARISING OUT OF, IN CONNECTION

WITH, RELATED TO, OR INCIDENTAL TO THE RELATIONSHIP BETWEEN THEM ESTABLISHED BY THIS GUARANTY AGREEMENT OR ANY OTHER FINANCING DOCUMENT.

Section 18. No Immunity.

The Guarantor represents and warrants that it is subject to civil and commercial law with respect to its obligations under this Guaranty Agreement, that the making and performance of this Guaranty Agreement constitute private and commercial acts rather than governmental or public acts and that neither the Guarantor nor any of its properties or revenues has any right of immunity from suit, court jurisdiction, attachment prior to judgment, attachment in aid of execution of a judgment, set-off, execution of a judgment, or from any other legal process with respect to its obligations under this Guaranty Agreement. To the extent that the Guarantor may hereafter be entitled, in any jurisdiction in which judicial or arbitral proceedings may at any time be commenced with respect to any Financing Document, to claim for itself or its revenues or assets any such immunity, and to the extent that in any such jurisdiction there may be attributed to the Guarantor such an immunity (whether or not claimed), the Guarantor hereby irrevocably agrees not to claim and hereby irrevocably waives such immunity. The foregoing waiver of immunity shall have effect under the United States Foreign Sovereign Immunities Act of 1976.

Section 19. Severability.

If any provision of this Guaranty Agreement is prohibited or held to be invalid, illegal, or unenforceable in any jurisdiction, the parties hereto agree to the fullest extent permitted by Applicable Law that it shall not affect the validity, legality, and enforceability of the other provisions of this Guaranty Agreement and shall not render such provision prohibited, invalid, illegal, or unenforceable in any other jurisdiction. If, and to the extent that, any obligation of the Guarantor (including its obligation under this Section 19) is unenforceable for any reason, the Guarantor agrees, independently of any other obligation hereunder, to make the maximum contribution to the payment and satisfaction thereof as is permissible under Applicable Law.

Section 20. Integration; Amendments.

This Guaranty Agreement and the other Financing Documents embody the entire understanding of the parties and supersede all prior negotiations, understandings, and agreements among them with respect to the subject matter hereof. The provisions of this Guaranty Agreement may be waived, supplemented, or amended only by an instrument in writing signed by the parties hereto.

Section 21. Waiver of Litigation Payments.

In the event that any action or lawsuit is initiated by or on behalf of DFC against the Borrower, the Guarantor, or any other party to any Financing Document, the Guarantor, to the fullest extent permissible under Applicable Law, irrevocably waives its right to, and agrees not to request, plead, or claim that a DFC Plaintiff post, pay, or offer, any Litigation Payment, and the Guarantor further waives any objection it may now or hereafter have to a DFC Plaintiff's claim that such DFC Plaintiff should be exempt or immune from posting, making, or offering any such Litigation Payment.

Section 22.   Indemnity.

The Guarantor shall, at all times, indemnify each Indemnified Person against, and hold each Indemnified Person harmless from, any Loss arising out of, in connection with or related to the non-payment of any Obligations precluded from payment under Applicable Law (including all-in cost caps applicable to the Loan under ECB Guidelines), or any actual or prospective claim, litigation, investigation or proceeding relating to any of the foregoing (a "***Proceeding***"), regardless of whether such Indemnified Person is a party thereto, whether or not such Proceeding is brought by the Borrower, the Guarantor, or any of the Borrower's or Guarantor's respective equity holders, affiliates, creditors or any other third person (the "***Guarantor Indemnity***"). The Guarantor Indemnity shall not apply to the extent that a court or arbitral tribunal with jurisdiction over the Loss and each Indemnified Person who has a Loss in connection therewith renders a final non-appealable determination that the Loss resulted from (a) the gross negligence or willful misconduct of the Indemnified Person, or (b) DFC's failure to perform any material act required of it hereunder. The Guarantor Indemnity is independent of and in addition to (i) any rights of any party hereto in connection with any Loss, and (ii) any other agreement, and shall survive the execution, modification, and amendment of this Guaranty Agreement and the other Financing Documents, the expiration, cancellation or termination of the Commitment, the disbursement and repayment of the Loan, and the provisions of any other indemnity. Any exclusion of an obligation to pay any amount under this Section 22 shall not affect the requirement to pay such amount under any other section hereof or under any other agreement. DFC and each Indemnified Person shall have the right to control its, his, or her defense; provided, however, that each Indemnified Person shall: (A) notify the Guarantor in writing as soon as practicable of any Loss, and (B) keep the Guarantor reasonably informed of material developments with respect thereto. In exercising the right and power to control his, her, or its actions in connection with a Loss, including a decision to settle any such Loss, each Indemnified Person shall, taking into account the nature and policies of such Indemnified Person (I) consult with the Guarantor, and (II) act as such Indemnified Person would act if the Loss or settlement were to be paid by such Indemnified Person. The Guarantor acknowledges and agrees that each Indemnified Person is an express, third-party beneficiary of the Guarantor's obligations under this Section 22.

Section 23.   Judgment Currency.

This is an international loan transaction in which the specification of Dollars is of the essence and such currency shall be the currency of account in all events. The payment obligations of the Guarantor to DFC hereunder shall only be discharged by an amount paid in another currency, whether pursuant to a judgment or otherwise, to the extent of the amount in Dollars received by DFC (after any premium and costs of exchange) on the prompt conversion to Dollars in the United States of the amount so paid in another currency under normal banking procedures. In the event that any payment by the Guarantor in another currency, whether pursuant to a judgment or otherwise, upon conversion and transfer, does not result in the payment of the amount of Dollars then due at the place such amount is due, DFC shall be entitled to demand immediate payment of, and shall have a separate cause of action against the Guarantor for, the additional amount necessary to yield the amount of Dollars then due. In the event that DFC, upon the conversion of a payment in another currency into Dollars, shall receive an amount greater than that to which it was entitled, the Guarantor shall be entitled to prompt reimbursement of the excess amount.

Section 24. Right of Set-off.

Upon the occurrence and during the continuance of any Event of Default, DFC is hereby authorized at any time and from time to time, to the fullest extent permitted by law, to set off and apply any and all deposits (general or special, time or demand, provisional or final) at any time held and other indebtedness at any time owing by DFC to or for the credit or the account of the Guarantor against any and all of the obligations of the Guarantor now or hereafter existing under this Guaranty Agreement, whether or not DFC shall have made any demand under this Guaranty Agreement and although such obligations may be contingent and unmatured. DFC agrees promptly to notify the Guarantor after any such set-off and application, provided however that the failure to give such notice shall not affect the validity of such set-off and application. The rights of DFC under this Section 24 are in addition to other rights and remedies (including other rights of set-off) which DFC may have.

Section 25. Fees and Expenses.

The Guarantor hereby agrees to pay any and all costs and expenses (including attorneys' fees and expenses) incurred by DFC in connection with this Guaranty Agreement, including, without limitation, all costs and expenses incurred by DFC in connection with collecting any amount due by the Guarantor hereunder, defending against any claims or counterclaims by the Guarantor, or enforcing any of DFC's rights, powers, or remedies contained herein.

Section 26. Arm's-Length Negotiations.

This Guaranty Agreement is the product of arm's-length negotiations between the Guarantor and DFC. The Guarantor has entered into this Guaranty Agreement freely, voluntarily and with the advice of legal counsel. Neither DFC nor the Guarantor shall be deemed to have drafted this Guaranty Agreement unilaterally. In the event a dispute arises regarding the meaning or application of any provision of this Guaranty Agreement, such provision shall not be construed by reference to any doctrine calling for ambiguities to be construed against the drafter of a document.

Section 27. Further Assurances.

The Guarantor shall execute and deliver to DFC such additional documents and take such additional action as DFC may require to carry out the purposes of this Guaranty Agreement, to cause this Guaranty Agreement to be duly registered, notarized, and stamped in any applicable jurisdiction, and to preserve and protect DFC's rights as contemplated herein.

Section 28. Counterparts.

This Guaranty Agreement may be executed in counterparts, each of which when so executed and delivered shall be deemed an original and all of which together shall constitute one and the same instrument. Delivery of an executed counterpart of this Guaranty Agreement in electronic format (i.e. "pdf" or "tif") shall be effective with the same force and effect as if the same were a manually executed counterpart of this Guaranty Agreement.

Section 29. Survival of Agreement.

Section 3, Section 4, Section 5, Section 6, Section 9, Section 10, Section 11, Section 16, Section 17, Section 22, Section 23, Section 24, Section 25, Section 26 and Section 29 shall survive the termination of the obligations of this Guaranty Agreement under Section 30.

Section 30. Termination.

Except as set forth in Section 29, the obligations of the Guarantor hereunder shall automatically terminate without any further action required by the Guarantor on the date on which all Obligations have been indefeasibly paid in full in Dollars in New York and the Borrower has no further right to request Disbursements of the Loan or to cause Notes to be issued.

[Signature page follows]

IN WITNESS WHEREOF, each of the parties hereto has caused this Guaranty Agreement to be executed and delivered on its behalf by its authorized representative as of the date first above written.

FIRST SOLAR, INC.

By:

Name:

Title:

By:

Name:

Title:

Accepted and Agreed:

UNITED STATES INTERNATIONAL DEVELOPMENT FINANCE CORPORATION

By:

Name:

Title:

SCHEDULE 1

WIRE INSTRUCTIONS FOR REMITTANCE OF PAYMENTS TO DFC

[Omitted]

EXHIBIT 31.1

CERTIFICATION OF CHIEF EXECUTIVE OFFICER
PURSUANT TO 15 U.S.C. SECTION 7241, AS
ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Mark R. Widmar, certify that:

(1) I have reviewed the Quarterly Report on Form 10-Q of First Solar, Inc., a Delaware corporation, for the period ended September 30, 2022, as filed with the Securities and Exchange Commission;

(2) Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

(3) Based on my knowledge, the financial statements and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of and for, the periods presented in this report;

(4) The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an Annual Report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

(5) The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

October 27, 2022	By:	/s/ MARK R. WIDMAR
	Name:	Mark R. Widmar
	Title:	Chief Executive Officer

EXHIBIT 31.2

CERTIFICATION OF CHIEF FINANCIAL OFFICER
PURSUANT TO 15 U.S.C. SECTION 7241, AS
ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Alexander R. Bradley, certify that:

(1) I have reviewed the Quarterly Report on Form 10-Q of First Solar, Inc., a Delaware corporation, for the period ended September 30, 2022, as filed with the Securities and Exchange Commission;

(2) Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

(3) Based on my knowledge, the financial statements and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of and for, the periods presented in this report;

(4) The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an Annual Report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

(5) The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

October 27, 2022	By:	/s/ ALEXANDER R. BRADLEY
	Name:	Alexander R. Bradley
	Title:	Chief Financial Officer

EXHIBIT 32.1

CERTIFICATION OF
CHIEF EXECUTIVE OFFICER AND CHIEF FINANCIAL OFFICER
PURSUANT TO 18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Quarterly Report on Form 10-Q of First Solar, Inc., a Delaware corporation, for the period ended September 30, 2022, as filed with the Securities and Exchange Commission, each of the undersigned officers of First Solar, Inc. certifies pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to his respective knowledge:

(1) the quarterly report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended; and

(2) the information contained in the quarterly report fairly presents, in all material respects, the financial condition and results of operations of First Solar, Inc. for the periods presented therein

October 27, 2022	By:	/s/ MARK R. WIDMAR
	Name:	Mark R. Widmar
	Title:	Chief Executive Officer
October 27, 2022	By:	/s/ ALEXANDER R. BRADLEY
	Name:	Alexander R. Bradley
	Title:	Chief Financial Officer