

# EPEAT Disclosure Report 2021



# TABLE OF CONTENTS

1.	Substances of Very High Concern (Criterion 5.2.1) .....	3
2.	Life Cycle Assessment (Criterion 7.1.2 and 7.2.1) .....	3
3.	Material Recovery Targets (Criterion 9.1.3) .....	4
4.	Corporate Reporting (Criterion 11.2.1) .....	4
5.	Corporate Reporting (Criterion 11.2.2) .....	9
6.	Public Disclosure of Use of Conflict Minerals in Products (Criterion 11.4.1) .....	10

*The following EPEAT disclosure report was prepared for conformance to the ANSI/NSF 457 Sustainability Leadership Standard.*

## 1. Substances of Very High Concern (Criterion 5.2.1)

First Solar Series 6 and Series 6 *Plus* PV modules consist of four articles: glass module, junction box, cable, and frame. These articles do not contain substances on the Candidate List of Substances of Very High Concern (SVHC) as defined by EU REACH regulation (revision date: June 25, 2020) above 0.1% by weight per article.

## 2. Life Cycle Assessment (Criterion 7.1.2 and 7.2.1)

First Solar conducted a life cycle assessment (LCA) of its Series 6 PV modules, which was published in the IEEE Journal of Photovoltaics: <https://ieeexplore.ieee.org/document/8305539> (doi: [10.1109/JPHOTOV.2018.2802786](https://doi.org/10.1109/JPHOTOV.2018.2802786)), in accordance with the requirements of the European Union Product Environmental Footprint Guide. A copy of the conference paper is available on First Solar's website and includes an overview of identified life cycle hotspots: [http://www.firstsolar.com/-/media/First-Solar/Sustainability-Documents/Sustainability-Studies/PVSC\\_44\\_Addressing-Hotspots-in-the-Product-Environmental-Footprint-of-CdTe-PV.ashx?dl=1](http://www.firstsolar.com/-/media/First-Solar/Sustainability-Documents/Sustainability-Studies/PVSC_44_Addressing-Hotspots-in-the-Product-Environmental-Footprint-of-CdTe-PV.ashx?dl=1).

The LCA quantifies the following mid-point indicators according to ILCD 2011 for First Solar Series 4 modules and First Solar Series 6 modules as follows:

3kWp installation, roof mounted (total all life stages, recycling benefits included)			
Impact category	Unit per kWh DC electricity	First Solar Series 4	First Solar Series 6
Climate change	kg CO2 eq	1.94E-02	1.66E-02
Ozone depletion	kg CFC-11 eq	8.78E-10	9.47E-10
Human toxicity, non-cancer effects	CTUh	4.95E-09	5.11E-09
Human toxicity, cancer effects	CTUh	5.97E-10	5.16E-10
Particulate matter	kg PM2.5 eq	9.95E-06	7.72E-06
Ionizing radiation HH	kBq U235 eq	9.06E-04	7.83E-04
Photochemical ozone formation	kg NMVOC eq	7.43E-05	5.62E-05
Acidification	molc H+ eq	1.46E-04	1.10E-04
Terrestrial eutrophication	molc N eq	2.76E-04	2.07E-04
Freshwater eutrophication	kg P eq	3.60E-06	3.51E-06
Marine eutrophication	kg N eq	2.54E-05	1.91E-05
Freshwater ecotoxicity	CTUe	7.63E-02	7.50E-02
Land use	kg C deficit	1.19E-02	8.61E-03
Water resource depletion	m3 water eq	7.83E-05	6.07E-05
Mineral, fossil & ren resource depletion	kg Sb eq	3.09E-06	2.58E-06
Cumulative energy demand non renewable	MJ	2.90E-01	2.47E-01
Cumulative energy demand renewable	MJ	3.63E+00	3.62E+00
Nuclear waste	m3 HAA eq	2.12E-11	1.84E-11

### 3. Material Recovery Targets (Criterion 9.1.3)

First Solar’s high-value PV recycling process recovers more than 90% of a First Solar module for reuse in new First Solar modules, glass products and rubber products. Approximately 90% of the glass and more than 90% of the semiconductor material and more than 90% of other metals are recovered at end-of-life.

First Solar PV Module Recycling Material Recovery Achievements	
<b>Glass</b>	= 90 mass-%
<b>Metals (not including semiconductor materials)</b>	≥ 90 mass-%
<b>Semiconductor Materials</b>	≥ 90 mass-%

### 4. Corporate Reporting (Criterion 11.2.1)

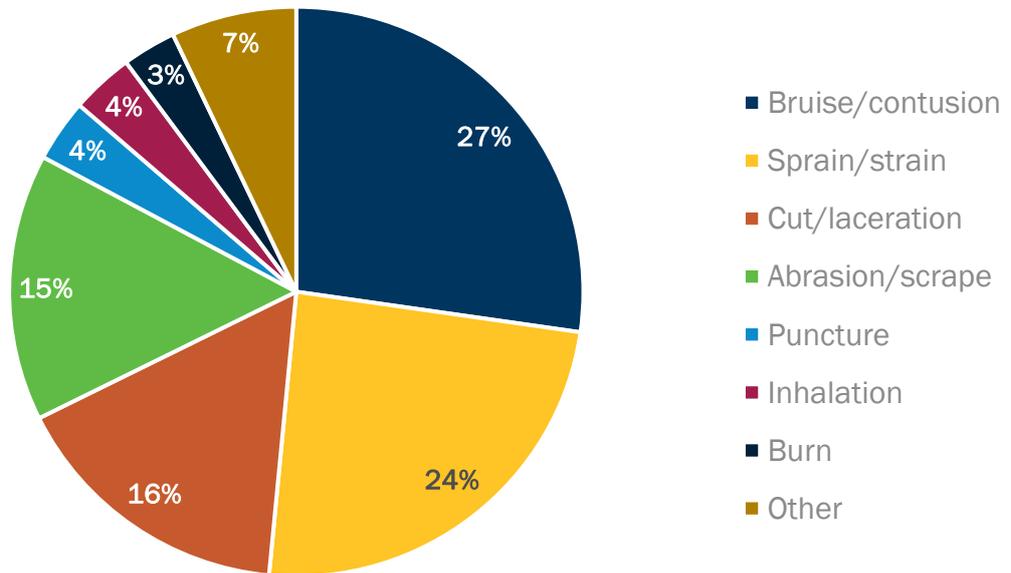
Key Performance Indicators	Reference Source of Key Performance Indicator			First Solar		
	GRI Standards <sup>4</sup>	SASB solar energy sustainability accounting standard <sup>30</sup>	SEIA Commitment <sup>28</sup>	2019	2020	Boundary
PV modules produced in MW AC in reporting period		RR-ST-000.A	Included	5,662	6,124	Manufacturing (Global)
Recycled input materials used (%)	301-2	RR0102-10		2.5-8%	4-10.5%	Semiconductor material (Global)
Standards, methodologies, assumptions, and/or calculation tools used				Disclosed recycled input materials in 2019 and 2020 is limited to the semiconductor material and is based on actual data from suppliers.		
Energy consumption within the organization	302-1	RR-ST-130a.1	Included	1,045,931 MWh (3,765,352 GJ)	868,060 MWh (3,125,016 GJ)	Global (equity share)
Total fuel consumption from non-renewable sources	302-1			86,531 MWh (311,512 GJ)	26,084 MWh (93,902 GJ)	Global (equity share)
Natural gas	302-1			21,973 MWh (79,103 GJ)	25,798 MWh (92,873 GJ)	Global (equity share)
Diesel/Gas oil	302-1			63,942 MWh (230,191 GJ)	156 MWh (562 GJ)	Global (equity share)
Motor Gasoline	302-1			616 MWh (2,218 GJ)	130 MWh (468 GJ)	Global (equity share)
Consumption of self-generated	302-1			7,172 MWh (25,819 GJ)	7,172 MWh (25,819 GJ)	Global (equity share)

non-fuel renewable energy- onsite solar						
Consumption of purchased electricity	302-1			952,228 MWh (3,428,021 GJ)	834,804 MWh (3,005,294 GJ)	Global (equity share)
Standards, methodologies, assumptions, and/or calculation tools used				Energy data is based on electricity bills. Solar generation is estimated based on size of the PV installations at our production sites in Ohio and Malaysia and at our recycling facility in Frankfurt Oder, Germany. Conversion factors from WRI GHG protocol. Heating, steam and cooling from non-renewable and renewable sources are not applicable, and fuel from renewable sources are not applicable. Electricity, heating, cooling, and steam was not sold.		
Energy consumption in manufacturing		RR0102-01.01		926,947 MWh (3,337,009 GJ)	795,915 MWh (2,865,294 GJ)	Manufacturing (Global)
Grid electricity consumed (%)		RR-ST-130a.1		91%	96%	Global (equity share)
Renewable energy consumed- onsite solar (%)		RR-ST-130a.1		1%	1%	Global (equity share)
Manufacturing Energy Intensity (kWh per Watt Produced)	302-3			0.16	0.13	Manufacturing (Global)
Standards, methodologies, assumptions, and/or calculation tools used				Data includes total energy (electricity and fuel) consumed global manufacturing operations on a per watt produced basis. The ratio uses energy consumption within the organization.		
Total water withdrawal from all sources (m3)	303-1	RR-ST-140a.1	Included	3,846,213	3,655,065	Manufacturing, Recycling and R&D (Global)
Water withdrawn in water stressed areas (%)		RR-ST-140a.1		0.01	0.005	Manufacturing, Recycling and R&D (Global)
Total water consumption from all sources (m3)	303-1	RR-ST-140a.1	Included	1,944,400	2,302,368	Manufacturing, Recycling and R&D (Global)
Water consumed in water stressed areas (%)		RR-ST-140a.1		0.015	0.007	Manufacturing, Recycling and R&D (Global)
Standards, methodologies, assumptions, and/or calculation tools used				All water withdrawals come from local municipal suppliers (third-party/freshwater). Data is based on water bills. In 2020, 0.005% of our water		

				<p>withdrawals came from water stressed areas, compared to 0.01% in 2019. We used the WWF Risk Filter Tool and defined stressed areas as having baseline water stress that is equal to/greater than 'High': 40-80%. In 2020, our Mesa, Arizona test site was the only one classed as water stressed and water withdrawals there decreased by more than 40% compared to 2019. For information on our water management approach, please see our sustainability report and CDP water response.</p>		
Direct GHG emissions- Scope 1 (MT CO <sub>2</sub> eq)	305-1		Included	26,520	7,037	Global (equity share)
Standards, methodologies, assumptions, and/or calculation tools used				<p>Data includes all greenhouse gases. Calculations are based on published criteria, such as emission factors and Global Warming Potential (GWP) rates from WRI GHG protocol and IPCC Fifth Assessment Report (AR5 – 100 year), respectively. Biogenic emissions are not applicable. For comparison purposes, the base year scope 1 emissions in 2008 were 1,020 MT CO<sub>2</sub>eq. The 2008 base year is the earliest year when First Solar international facilities started operating. Consolidation approach is based on equity share.</p>		
Energy indirect GHG emissions- Scope 2 (MT CO <sub>2</sub> eq)	305-2		Included	441,692	344,697	Global (equity share)
Standards, methodologies, assumptions, and/or calculation tools used				<p>Data includes all greenhouse gases for market-based scope 2 emissions. Calculations are based on published criteria, such as emission factors and Global Warming Potential (GWP) rates from WRI GHG protocol and IPCC Fifth Assessment Report (AR5 – 100 year), respectively. For comparison purposes, the base year scope 2 emissions in 2008 were 123,046 MT CO<sub>2</sub>eq. The 2008 base year is the earliest year when First Solar international facilities started operating. Biogenic emissions are not applicable. Consolidation approach is based on equity share.</p>		
Waste by type and disposal method	306-2		Included	<a href="#">Sustainability Report (pg.27 and 63)</a>	<a href="#">Sustainability Report (pg.27 and 63)</a>	Manufacturing (Global)
Standards, methodologies, assumptions, and/or calculation tools used				<p>Data includes waste disposed (landfill or incineration) and recycled by type (hazardous or non-hazardous) in accordance with 2016 GRI standards. Approximately 50% of waste disposed (~4,100 metric tons in 2020 and ~7,000 metric tons in 2019) was incinerated and the rest is sent to landfill. Waste disposal method determined by information provided by the waste</p>		

				disposal contractor. 2020 GRI Waste standard will be used going forward.		
Type of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work related fatalities	403-9		Included	<a href="#">Sustainability Report (pg. 64)</a>	<a href="#">Sustainability Report (pg. 43 and 64)</a>	Global (manufacturing and offices)
Standards, methodologies, assumptions, and/or calculation tools used				<p>Safety data includes all global manufacturing, R&amp;D and office locations. Rates of injury are calculated per 200,000 hours. First Solar's manufacturing data covers all processes (from the beginning of the manufacturing process to the finished module) and includes all of the company's manufacturing facilities in the U.S., Malaysia and Vietnam. First Solar's advanced thin film modules are manufactured in a high-throughput, automated environment that integrates all manufacturing steps into a continuous flow operation under one roof. First Solar's safety management system hazard identification and risk assessment process identified the following hazards that have the potential for serious injury or fatality: confined space entry, electrical exposure and arc flash, line of fire, lock out/tag out, machine guards, vehicle collision, working with a suspended load, and working at heights. First Solar has developed EHS Design Requirements for new equipment that includes equipment and machine safety requirements. Training and procedures are in place to identify and control potential hazards.</p>		

Injuries by Type (2019)



## 5. Corporate Reporting (Criterion 11.2.2)

Key Performance Indicators	Reference Source of Key Performance Indicator			First Solar		
	GRI Standards <sup>14</sup>	SASB solar energy sustainability accounting standard <sup>30</sup>	SEIA Commitment <sup>28</sup>	2019	2020	Boundary
Reduction of energy consumption	302-4			3,262 MWh (11,746 GJ)	2,948 MWh (10,613 GJ)	Global Manufacturing (electricity)
Standards, methodologies, assumptions, and/or calculation tools used				Engineering measurements of lighting and HVAC electricity conservation projects using previous year as a baseline, in order to show annual progress. Scope 2 WRI/WBCSD GHG Protocol.		
Water withdrawn in water stressed areas	303-3	RR-ST-140a.1 (or WBCSD Global Water Tool <sup>40</sup> )		0.292 megaliters (0.01%)	0.170 megaliters (0.005%)	Manufacturing, Recycling and R&D (Global)
Standards, methodologies, assumptions, and/or calculation tools used				In 2020, 0.005% of our water withdrawals came from water stressed areas, compared to 0.01% in 2019. We used the WWF Risk Filter Tool and defined stressed areas as having baseline water stress that is equal to/greater than 'High': 40-80%. In 2020, our Mesa, Arizona test site was the only one classed as water stressed and water withdrawals there decreased by more than 40% compared to 2019, from 0.292 megaliters in 2019 to 0.170 megaliters in 2020. 100% of our withdrawals come from local municipal suppliers (third-party/ freshwater), including 100% third-party water from surface water for our Mesa, Arizona test site.		
Water recycled and reused (m3)	303-3			299,969	290,011	Manufacturing, Recycling and R&D (Global)
Standards, methodologies, assumptions, and/or calculation tools used				We measure the amount of water recycled at our manufacturing and recycling facilities in Malaysia, Ohio, Vietnam and Germany, which represented 99.9% of our water withdrawals in 2020. We recycled approximately 300 megaliters in 2019 and 290 megaliters in 2020 (or approximately 8% of our total water withdrawals) across our operations.		
GHG emissions intensity (metric tons of CO <sub>2</sub> -eq / MW produced)	305-4			83	57	Global (equity share)
Standards, methodologies, assumptions, and/or calculation tools used				In 2019 and 2020, our GHG emissions intensity includes direct (scope 1) and indirect (scope 2) emissions of all manufacturing and recycling plants, R&D and testing facilities, EPC-owned		

				construction equipment, company-owned operational solar projects, and company-owned vehicle fleet on a carbon intensity basis measured per megawatt (MW) of PV modules produced. All GHGs are included in the calculations.		
Reduction of GHG emissions (metric tons CO2-eq)	305-5			Scope 1: 0 Scope 2: 1,205	Scope 1: 0 Scope 2: 1,233	Global Manufacturing (electricity)
Standards, methodologies, assumptions, and/or calculation tools used				Scope 1 and 2 WRI/WBCSD GHG Protocol using previous year as baseline, in order to show annual progress. In 2019, we implemented a lighting project at its manufacturing facility in Malaysia, and a lighting and HVAC projects at its manufacturing facility in Vietnam. These measures resulted in savings of 1,205 metric tons CO2-eq from avoided electricity consumption in 2019. Our scope 1 and 2 emissions in the previous year (2018) amounted to 356,288 metric tons CO2-eq. This amounted to a 0.34% decrease in our gross global emissions in 2019. All GHGs are included in the calculations. In 2020, we implemented a re-lighting and chiller optimization project at its manufacturing facility in Malaysia, and various lighting, HVAC, and chiller optimization projects at its manufacturing facility in Vietnam. These measures resulted in savings of 1,233 metric tons CO2-eq in 2020 from avoided electricity consumption in 2020. Our scope 1 and 2 emissions in the previous year (2019) amounted to 468,212 metric tons CO2-eq. This amounted to a 0.26% decrease in our gross global emissions in 2020. All GHGs are included in the calculations.		
Product Recycling Program in Place			Included	<a href="#">Yes</a>	<a href="#">Yes</a>	Global

First Solar’s manufacturing data covers all processes (from the beginning of the manufacturing process to finished module) and includes all of the company’s manufacturing facilities in the U.S., Malaysia and Vietnam. First Solar’s advanced thin film modules are manufactured in a high-throughput, automated environment that integrates all manufacturing steps into a continuous flow operation under one roof.

## 6. Public Disclosure of Use of Conflict Minerals in Products (Criterion 11.4.1)

First Solar is committed to responsible sourcing and operating a supply chain free of conflict minerals. First Solar’s [Specialized Disclosure and Conflict Minerals reports](#) are available on our public website (see “Specialized Disclosure” tab in SEC Filings).