

First Solar Sustainability Metrics

JUNE 2019



As part of our commitment to transparency, First Solar reports on a number of selected sustainability performance metrics including our recordable injury rate, energy and water use, waste generation, and greenhouse gas emissions.

In addition to manufacturing photovoltaic (PV) modules with the lowest environmental impact in the industry, First Solar is committed to reducing the company's own operational impact. Since 2009, we've successfully reduced our energy, water, waste, and carbon intensity per watt produced through improvements in module efficiency, manufacturing throughput and capacity utilization, as well as by implementing resource conservation projects at our facilities.

In November 2016, we announced plans for the introduction of our Series 6 technology- a larger, more efficient and still recyclable PV module. During 2018, we commenced commercial production of Series 6 modules at our manufacturing facilities in Perrysburg, Ohio; Kulim, Malaysia; and Ho Chi Minh City, Vietnam. We produced 2.7 GW DC of solar modules in 2018, which represented an 18% increase from 2017. The increase in production was partially offset by the ramp down of certain Series 4 production lines.

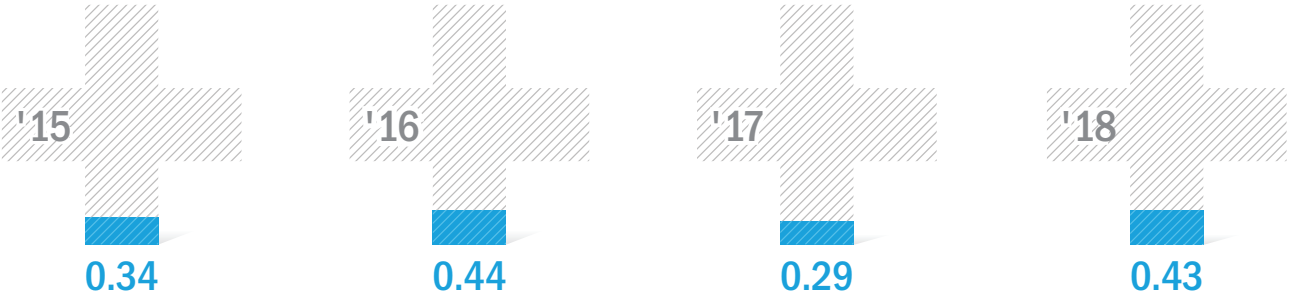
The increase in our production capacity and throughput helped reduce our waste intensity in 2018. Our manufacturing energy and water intensity increased in 2018 due to the start-up of new manufacturing facilities and higher under-utilization associated with the initial ramp of Series 6 manufacturing lines. The amount of waste disposed increased as a result of the decommissioning of Series 4 manufacturing equipment and materials generated during the initial start-up phase of our Series 6 production lines.

In 2018, we surpassed our 2021 goal to reduce our greenhouse (GHG) emissions intensity per watt produced by 45 percent compared to our 2008 baseline. Although our production increased by 18% in 2018, our absolute greenhouse gas emissions only increased by 9%. While we have already achieved our new five-year goal for 2021, we are continuing our retooling and ramping activities. As such, maintaining our progress through 2021 will be an important achievement. Since 2008, we have nearly halved our company-wide carbon intensity through increased module efficiency, manufacturing throughput, and capacity utilization, decreased emissions intensity of purchased grid electricity, and energy conservation and low carbon initiatives.

Recordable Injury Rate (Per 200,000 Hours of Exposure) 2015 – 2018

FIRST SOLAR

4.1
industry
average



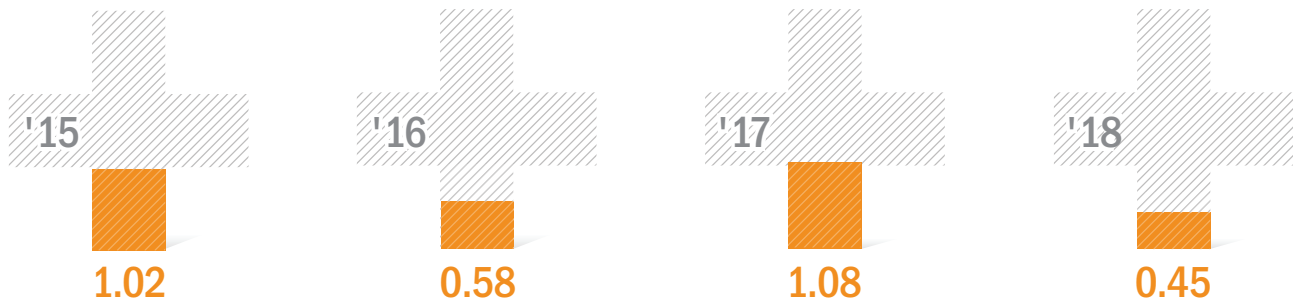
- “Safety First” is a core value at First Solar and we strive for an injury-free workplace.
- Since 2008, First Solar has reduced its recordable injury rate by approximately 80% (from 2.6) by establishing a strong safety culture throughout the company and ensuring an understanding of First Solar’s Safety Policies and Procedures.
- First Solar’s recordable injury rate (RIR) includes all First Solar associates including manufacturing, R&D, construction, maintenance and operation, and office personnel.
- An injury is considered recordable if it requires medical attention beyond first aid.
- First Solar’s company-wide RIR is about 10 times lower than the manufacturing industry average.

Incidence rates represent the number of injuries per 200,000 hours based on 100 full-time equivalent workers (working 40 hours per week, 50 weeks per year). Industry averages are based on 3-year mean OSHA injury rates for glass manufacturing. Source: NAICS 327215, 23713, and 221110, 2015-2017, Bureau of Labor Statistics (BLS).

Recordable Injury Rate (Per 200,000 Hours of Exposure) 2015 – 2018

EPC CONTRACTORS

2.6
industry
average



O&M

1.3
industry
average

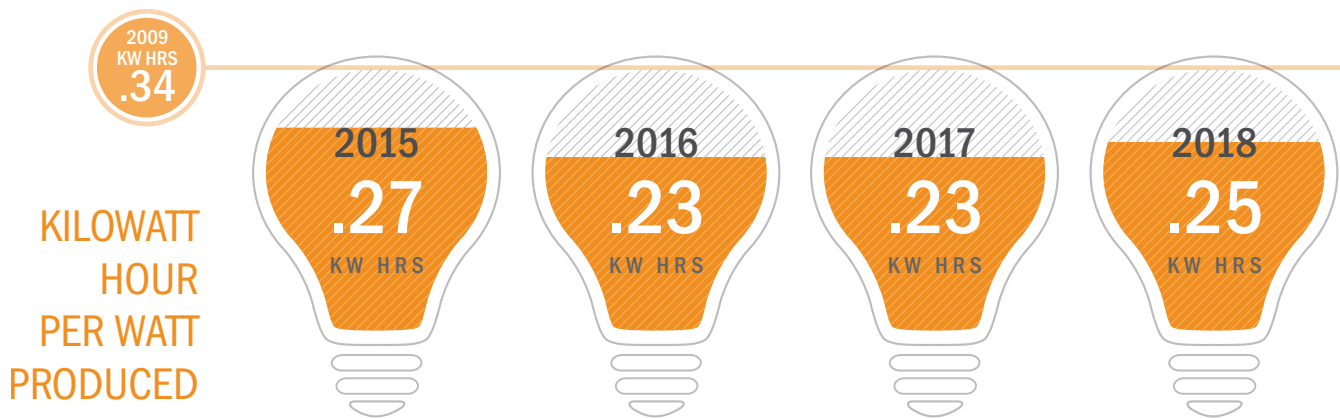


- The engineering, procurement and construction (EPC) RIR includes PV array construction workers that were contracted by First Solar. The O&M RIR includes all First Solar operation and maintenance personnel.
- Since 2011, First Solar has reduced its EPC RIR by approximately 60% (from 1.16) by standardizing processes at our project sites. First Solar's EPC RIR of less than 1 is below the average construction industry rate.
- When third-party policies and procedures are deemed to be insufficient, contractors are required to adopt, administer and comply with First Solar safety policies, programs and procedures.
- In 2017, we increasingly began developing projects in new regions of the U.S. which did not benefit from the contractor experience base developed over several years in other regions. Nonetheless, the majority of these contractor injuries consisted of bug bites and bee stings. The 2015 and 2017 EPC injury rates have been updated to reflect injuries that were initially reported as first aid events, but later became recordable.
- In 2016, First Solar's Energy Services (O&M) team achieved a safety milestone of one million hours worked without a recordable injury since 2013. Due to the uptick in incidences across the company in 2018, we initiated a cross-functional safety revitalization program focusing on safety leadership, associate engagement and improved communication.

Incidence rates represent the number of injuries per 200,000 hours based on 100 full-time equivalent workers (working 40 hours per week, 50 weeks per year). Industry averages are based on 3-year mean OSHA injury rates for Heavy and civil engineering (EPC), and electric power generation industry (O&M). Source: NAICS 327215, 23713, and 221110, 2015-2017, Bureau of Labor Statistics (BLS).

Manufacturing Energy Intensity

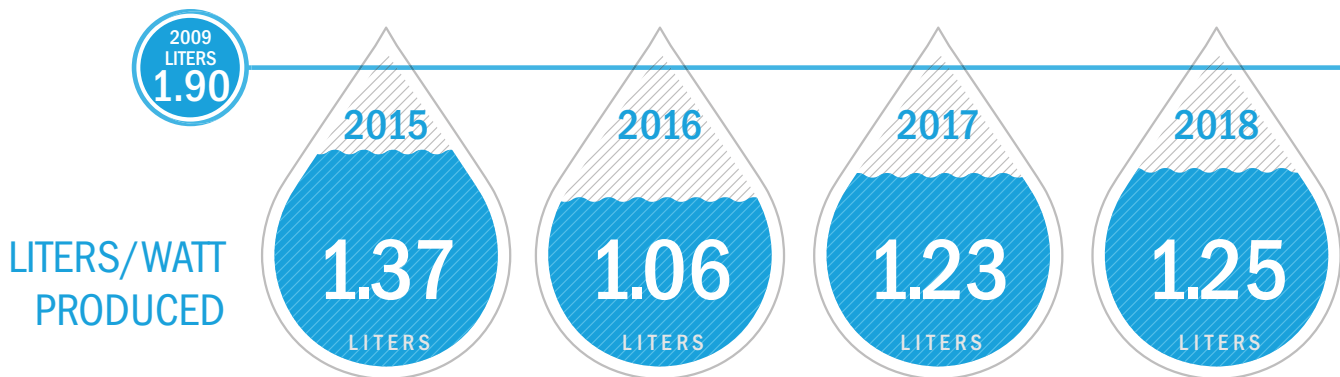
2015 – 2018



- First Solar’s manufacturing energy intensity (energy consumption per watt produced) includes all processes from the beginning of our manufacturing process to finished panel.
- Since 2009, our manufacturing energy intensity has decreased by approximately 30% due to increased manufacturing throughput and module efficiency, as well as the implementation of energy conservation initiatives.
- In 2016 and 2017, our manufacturing energy intensity remained relatively flat despite the changes in our production output associated with the transition to our Series 6 module technology and manufacturing equipment.
- During 2018, we commenced commercial production of Series 6 modules at our manufacturing facilities in Perrysburg, Ohio; Kulim, Malaysia; and Ho Chi Minh City, Vietnam. We produced 2.7 GW DC of solar modules during 2018, which represented an 18% increase from 2017.
- In 2018, our absolute manufacturing energy consumption increased by more than 30% primarily due to the ramp up of new manufacturing facilities. The increase in production was partially offset by the ramp down of certain Series 4 production lines. Higher under-utilization associated with the initial ramp of S6 manufacturing contributed to the increase in our manufacturing energy intensity in 2018.

Manufacturing Water Intensity

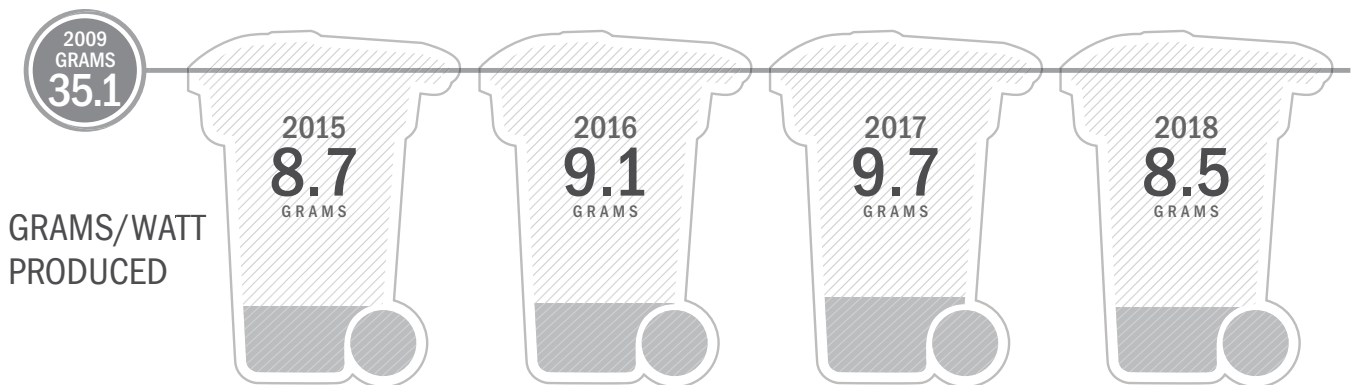
2015 – 2018



- Since 2009, First Solar’s manufacturing water intensity (water consumption per watt produced) has decreased by 34% due to significant improvements in module efficiency, manufacturing throughput, and the implementation of water conservation and recycling projects.
- In 2018, First Solar’s manufacturing water intensity increased by approximately 2% due to the ramp up of production and the start-up of new manufacturing facilities.
- By recycling rejected water from our purification system back into our raw water tank in Malaysia, we saved over 118 million liters of water (equivalent to 4% of our absolute water use in 2018).
- In addition to recycling water, we are also working on reducing the amount of wastewater discharged by retrofitting our recycling facilities. As of January 2018, all routinely-operated First Solar recycling facilities in the U.S., Germany, and Malaysia, generate zero wastewater discharge.
- Instead, the wastewater is recycled and converted into freshwater, which can then be reused in the recycling process. As part of the retrofit, we recycled more than 11 million liters of water in 2018 at our global recycling facilities.
- In total, we recycled more than 129 million liters of water in 2018, which is equivalent to nearly 52 Olympic-sized swimming pools!

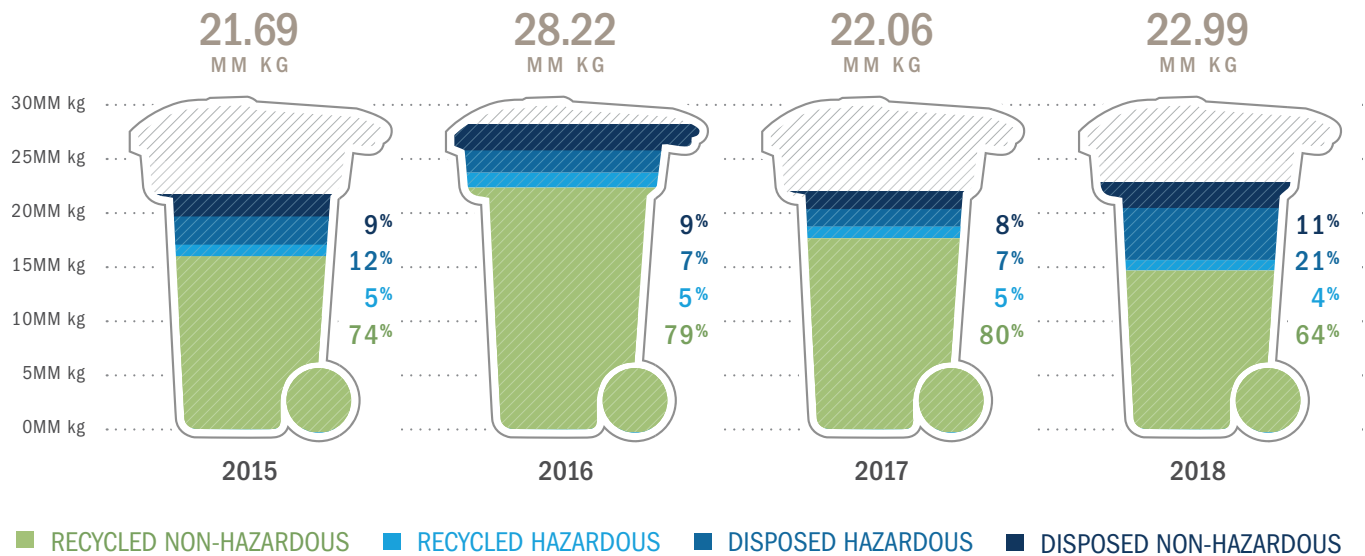
Manufacturing Waste Intensity

2015 – 2018



- First Solar’s manufacturing waste generation intensity (grams per watt produced) has decreased by more than 75% since 2009 as a result of increased module and manufacturing efficiency combined with recycling and waste minimization projects.
- In 2018, our manufacturing waste intensity decreased by 12% primarily due to increased manufacturing throughput related to the ramp up of our Series 6 production lines.
- Although production increased 18% in 2018, absolute waste generation only increased by 4%.

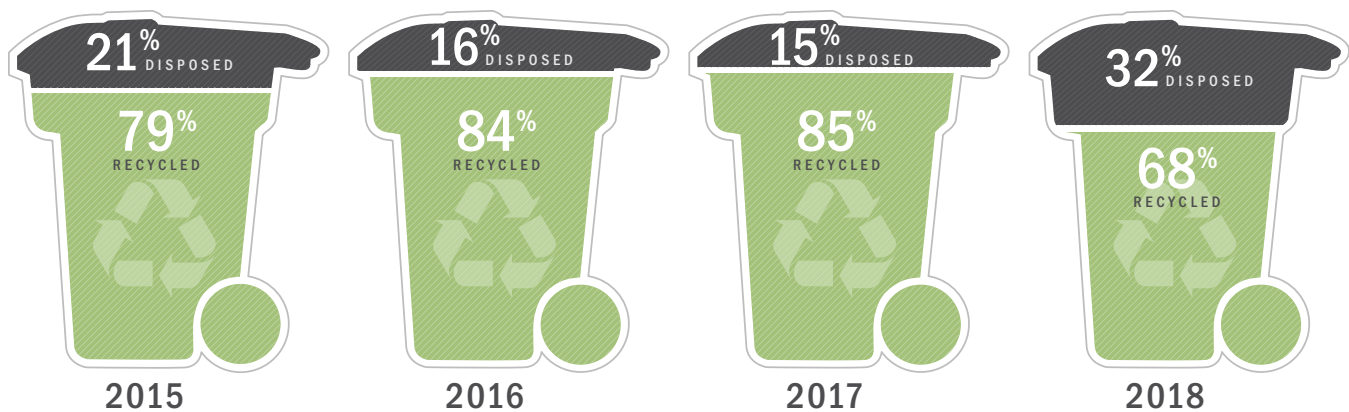
Manufacturing Waste by Type & Destination 2015 – 2018



- This graph depicts First Solar’s absolute manufacturing waste produced in kilograms (kg) with a percentage breakdown by type and destination.
- First Solar is committed to reducing and recycling hazardous waste in line with our environmental management system objectives of minimizing waste and preventing pollution. In 2018, hazardous waste disposal increased as a result of the decommissioning of Series 4 manufacturing equipment and materials generated during the initial start-up phase of our Series 6 production lines. Going forward, we are increasing our recycling capacity and moving towards 24/7 recycling in order to help manage these impacts.
- Hazardous waste is classified according to the definition used by the countries in which we operate, e.g. under the Environmental Quality (Scheduled Wastes) Regulations in Malaysia, Law No. 55/2014/QH13 on Environmental Protection in Vietnam, and the Resource Conservation and Recovery Act in the U.S.

Manufacturing Waste Recycled vs. Disposed

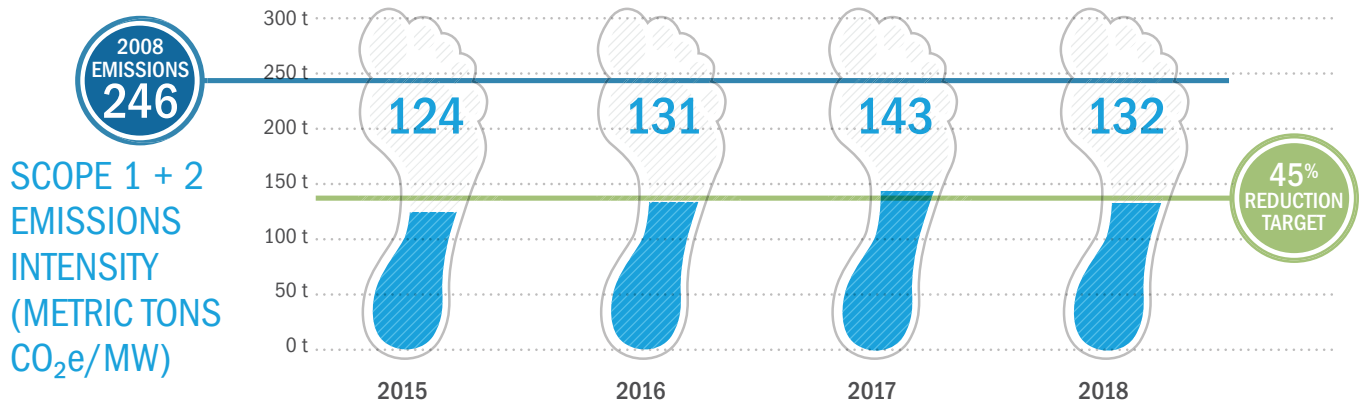
2015 – 2018



- This graph depicts waste recycled and disposed by First Solar’s manufacturing and recycling facilities in Perrysburg, Ohio; Kulim, Malaysia; and Ho Chi Minh City, Vietnam as of 2018.
- The amount of waste disposed increased in 2018 due to the decommissioning of Series 4 manufacturing equipment and materials generated during the initial start-up phase of our Series 6 production lines.
- The data includes modules that we recycle onsite; both manufacturing line scrap and modules returned from the field but does not include modules that are being recycled at our recycling facility in Germany.
- First Solar’s state-of-the-art recycling process recovers more than 90 percent of the semiconductor material and 90 percent of the glass.
- The glass cullet is reused in new glass products and the unrefined semiconductor material is sent for further processing to be reused in new First Solar modules.
- Our laminate material which would normally be sent for disposal, is now being recycled in Malaysia for reuse in products such as rubber mats, bicycle handles, and shoe soles, thereby further closing the loop on our product’s life cycle.
- Many other manufacturing byproducts are recycled.
- Overall, of the total material First Solar sends off-site, 68% is sent for beneficial reuse and not to landfill.

Greenhouse Gas Emissions

2015 – 2018



- After surpassing our greenhouse gas (GHG) emissions reduction goal in 2016, we set a new five-year goal for 2021 to reduce our GHG emissions intensity per watt produced by 45 percent compared to our 2008 baseline.
- The chart depicts 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 MW produced.
- Since 2008, our company-wide carbon intensity decreased by approximately 46% through increased module efficiency, manufacturing throughput, and capacity utilization, decreased emissions intensity of purchased grid electricity, and energy conservation and low carbon initiatives.
- Our GHG emissions intensity increased in 2017 due to the temporary ramp down in production. In 2018, our GHG emissions intensity decreased due to a reduction in the site-specific CO2 emission factor of grid electricity purchased in Malaysia and the implementation of energy efficiency initiatives at our manufacturing sites. Although our production increased by 18% in 2018, our absolute GHG emissions only increased by approximately 9%.

Key Performance Indicators

2016 – 2018

KEY PERFORMANCE INDICATORS	2016	2017	2018	GRI STD
Net Sales (\$ Billion)	2.904	2.941	2.244	102-7
Total Modules Produced (Millions)	27.1	19.4	18.8	102-7
Total Gigawatts Produced (GW)	3.10	2.28	2.71	102-7
Total GHG Emissions (Metric Tons CO ₂ eq)	406,108	325,518	356,288	305-1 & 2
Scope 1 GHG Emissions (Metric Tons CO ₂ eq)	14,730	16,161	22,200	305-1
Scope 2 GHG Emissions (Metric Tons CO ₂ eq)	391,378	309,357	334,088	305-2
Total GHG Intensity (Metric Tons CO ₂ per Megawatt Produced)	131	143	132	305-4
Total Electricity Consumption (MWh)	721,802	525,440	684,763	302-1
Consumption of Purchased Non-Renewable Electricity (MWh)	714,630	518,268	677,591	302-1
Consumption of Self-Generated Renewable Electricity- Solar (MWh)	7,172	7,172	7,172	302-1
Total Fuel Consumption From Non-Renewable Sources (MWh)	51,896	54,871	76,812	302-1
Natural Gas	12,220	13,073	15,437	302-1
Diesel/Gas oil	31,055	32,758	32,444	302-1
Motor Gasoline	8,621	9,040	28,931	302-1
Manufacturing Energy Intensity (kWh per Watt Produced)	0.23	0.23	0.25	302-3
Total Manufacturing Water Use (Billion Liters)	3.28	2.82	3.38	303-1
Manufacturing Water Intensity (Liters per Watt Produced)	1.06	1.23	1.25	--
Total Waste Generation (Million Kilograms)	28.22	22.06	22.99	306-2
Recycled Non-Hazardous (Million Kilograms)	22.38	17.72	14.78	306-2
Recycled Hazardous (Million Kilograms)	1.39	1.07	0.96	306-2
Disposed Non-Hazardous (Million Kilograms)	2.41	1.66	2.41	306-2
Disposed Hazardous (Million Kilograms)	2.04	1.61	4.84	306-2
Manufacturing Waste Intensity (Grams per Watt Produced)	9.1	9.7	8.5	--
Total Wastewater Discharge (Billion Liters)	1.83	1.48	1.49	306-1
Wastewater Generation Intensity (Liters per Watt produced)	0.59	0.65	0.55	--
Total Number of Associates	5,358	4,130	6,433	102-7
New Hires by Gender (% Male)	78%	65%	83%	401-1
New Hires by Gender (% Female)	22%	35%	17%	401-1
First Solar Recordable Injury Rate (per 200,000 hours)	0.44	0.29	0.43	403-2
EPC Site Recordable Injury Rate (per 200,000 hours)	0.58	1.08	0.45	403-2
O&M Site Recordable Injury Rate (per 200,000 hours)	0.00	0.57	1.04	403-2
First Solar Lost Time Injury Rate (per 200,000 hours)	0.26	0.19	0.26	403-2
EPC Lost Time Injury Rate (per 200,000 hours)	0.12	0.15	0.22	403-2
Total Training Hours	33,014	35,752	189,699	404-1
Average Training Hours by Gender (Male)	6	9	30	404-1
Average Training Hours by Gender (Female)	6	8	26	404-1
% Male Workforce	81%	82%	83%	405-1
% Female Workforce	19%	18%	17%	405-1
% Male Management	82%	81%	82%	405-1
% Female Management	18%	19%	18%	405-1
ISO 14001 Certification of Mfg. %	100%	100%	75%	--
OHSAS 18001/ ISO 45001 Certification of Mfg. %	100%	100%	75%	--

*The 2017 EPC injury rate has been updated to reflect two injuries that were initially reported as first aid events, but later became recordable. First Solar training data excludes training related to Manufacturing, IT, EPC, O&M, HR, and other functional groups as well as on-demand training available through Biz Library. Our new manufacturing site in Vietnam commenced production in 2018 and achieved certification to ISO 14001 and ISO 45001 standards in 2019. First Solar requires all new facilities to achieve certification within 12 months after ramp-up.