Water 2017 Information Request
First Solar Inc

1 Module: Introduction

1. Page: W0. Introduction

W0.1

Introduction

Please give a general description and introduction to your organization

First Solar, Inc., is a leading global provider of comprehensive photovoltaic (PV) solar energy solutions with over 17 GW sold worldwide. We design, manufacture, and sell PV solar modules with an advanced thin-film semiconductor technology and also develop, design, construct, and sell PV solar power systems that primarily use the modules we manufacture. Additionally, we provide operations and maintenance (“O&M”) services to system owners. We have substantial, ongoing research and development efforts focused on module and system level innovations. We are the world’s largest thin-film PV solar module manufacturer and one of the world’s largest PV solar module manufacturers. Our mission is to create enduring value by enabling a world powered by clean, affordable solar energy.

First Solar's proven solar solutions diversify the energy portfolio and reduce the risk of fuel-price volatility while delivering a levelized cost of electricity (LCOE) that is cost competitive with fossil fuels today. First Solar has set the benchmark for environmentally responsible product life cycle management by introducing the industry's first global and comprehensive recycling program for solar modules. We are committed to minimizing the environmental impacts and enhancing the social and economic benefits of our products across their life cycle, from raw material sourcing through product end-of-life. For more information about First Solar, please visit www.firstsolar.com

First Solar was founded in 1999 and commercialized a unique thin-film PV solar technology. Since we began commercial production in 2002, we have focused on our mission of enabling a world powered by clean, affordable, and reliable solar electricity and we have grown to become the world's largest thin film PV solar manufacturer and one of the world's leading PV solar manufacturers. Since 2002 and through 2016, we have sold approximately 17 GW of PV solar modules. Assuming average worldwide irradiance and grid electricity emissions, our products are being used to displace nearly 12 million metric tons of CO2e per year during their 25+ year product life. This is equivalent to powering more than 8 million average homes, planting 300 million trees and saving 30 billion liters of water (or 12,000+ Olympic swimming pools) per year based on worldwide averages.

W0.2

Reporting year

Please state the start and end date of the year for which you are reporting data

Period for which data is reported
Fri 01 Jan 2016 - Sat 31 Dec 2016

W0.3

Reporting boundary

Please indicate the category that describes the reporting boundary for companies, entities, or groups for which water-related impacts are reported

Other: Global manufacturing, recycling and R&D operations

W0.4

Exclusions

Are there any geographies, facilities or types of water inputs/outputs within this boundary which are not included in your disclosure?

No

Further Information

2 Module: Current State

2. Page: W1. Context

W1.1

Please rate the importance (current and future) of water quality and water quantity to the success of your organization

Water quality and quantity	Direct use importance rating	Indirect use importance rating	Please explain
Sufficient amounts of good quality freshwater available for use	Vital for operations	Important	Water quality is vital for our operations and our thin film solar photovoltaic manufacturing process relies on ultra pure water production. First Solar conducted a life cycle water assessment of our thin film PV technology which

Water quality and quantity	Direct use importance rating	Indirect use importance rating	Please explain
			concluded that the life cycle water withdrawal of cadmium telluride (CdTe) PV ranges from approximately 382– 425 L/MWh. (Source:Sinha, Meader and de Wild-Scholten, Life Cycle Water Usage in CdTe Photovoltaics, IEEE, Journal of Photovoltaics, 2012.) Direct onsite water use represents only ~12% of CdTe PV's life cycle water withdrawal. The remainder is related to indirect water withdrawal from the use of grid electricity and raw materials throughout the product life cycle. Primary contributors to life cycle water withdrawal in our supply chain include the use of grid electricity, glass, steel and copper production, chemical use, and transport during takeback and recycling.
Sufficient amounts of recycled, brackish and/or produced water available for use	Not important at all	Not important at all	First Solar does not use brackish or produced water for our operations.

W1.2

For your total operations, please detail which of the following water aspects are regularly measured and monitored and provide an explanation as to why or why not

Water aspect	% of sites/facilities/operations	Please explain
Water withdrawals-total volumes	76-100	We regularly measure and monitor 100% of our total withdrawals from our manufacturing, recycling, and R&D facilities. In 2016, total water withdrawal across our operations amounted to approximately 3.29 billion liters of water. Our manufacturing facilities in Ohio and Malaysia represent more than 99% of our water withdrawals (3.28 billion liters in 2016).
Water withdrawals-volume by sources	76-100	We regularly monitor and measure 100% of the total water withdrawals of our manufacturing, recycling, and R&D facilities. All withdrawals come from the local municipal supply (freshwater).
Water discharges-total volumes	76-100	We regularly monitor and measure 100% of the water discharges of our manufacturing, recycling, and R&D facilities. In 2016, total water discharges from our manufacturing, recycling, and R&D facilities amounted to approximately 1.84 billion liters. Our manufacturing facilities in Ohio and Malaysia represent more than 99% of our total water discharges (1.83 billion liters in 2016).
Water discharges-volume by destination	76-100	We regularly monitor and measure 100% of the water discharges by destination of our manufacturing, recycling, and R&D facilities. In 2016, approximately 56% of First Solar’s total water withdrawn from water utilities (3.29 billion liters) was discharged as wastewater from our industrial wastewater treatment systems- Approximately 10% was sent to a municipal wastewater facility and approximately 90% is discharged directly to river. The remaining 44 percent of our total water (~1.45 billion liters) was used for irrigation, cooling towers, sanitary purposes, or recycled.
Water discharges-volume by treatment method	76-100	We regularly monitor and measure 100% of our total water discharge volumes by treatment method. In 2016, we treated ~1.83 billion liters of industrial wastewater at our manufacturing

Water aspect	% of sites/facilities/operations	Please explain
		facilities in Ohio and Malaysia using a batch discharge system. Our facilities in Ohio and Malaysia represent more than 99% of our total water discharges. Once treated, the water is collected in holding tanks, which are sampled and tested to confirm compliance with regulatory limits before being discharged. No industrial wastewater leaves our site unless we have tested and approved it for discharge, even if it is being discharged to a municipal wastewater treatment plant. If the water contaminant levels are above the permitted discharge limit, it is sent for re-treatment internally.
Water discharge quality data- quality by standard effluent parameters	76-100	We regularly monitor and measure 100% of our water discharge quality by standard effluent parameters as well as for heavy metals. First Solar factories are equipped with state-of-the-art analytical capabilities for in-house wastewater testing.
Water consumption- total volume	76-100	We are able to estimate water consumption by subtracting total water discharges from total water withdrawals.3,287.59-1,837.88= 1,449.71 megaliters.
Facilities providing fully-functioning WASH services for all workers	76-100	Our total water withdrawal data includes sanitary water use at our manufacturing and recycling facilities.

W1.2a

Water withdrawals: for the reporting year, please provide total water withdrawal data by source, across your operations

Source	Quantity (megaliters/year)	How does total water withdrawals for this source compare to the last reporting year?	Comment
Fresh surface water	0.00	Not applicable	Not relevant.
Brackish surface water/seawater	0.00	Not applicable	Not relevant.
Rainwater	0.00	Not applicable	Not relevant.
Groundwater - renewable	0.00	Not applicable	Not relevant.
Groundwater - non-renewable	0.00	Not applicable	Not relevant.
Produced/process water	0.00	Not applicable	Not relevant.
Municipal supply	3287.59	Lower	Our total water withdrawals decreased by approximately 4% in 2016, compared to 2015. This includes total water withdrawals for all our manufacturing, recycling and R&D facilities.
Wastewater from another organization	0.00	Not applicable	Not relevant.
Total	3287.59	Lower	Our total water withdrawals decreased by approximately 4% in 2016, compared to 2015. This includes total water withdrawals for all our manufacturing, recycling and R&D facilities.

W1.2b

Water discharges: for the reporting year, please provide total water discharge data by destination, across your operations

Destination	Quantity (megaliters/year)	How does total water discharged to this destination compare to the last reporting year?	Comment
Fresh surface water	1656.28	Higher	Our direct wastewater discharge increased approximately 2% in 2016, compared to 2015.
Brackish surface water/seawater	0.00	Not applicable	Not relevant.
Groundwater	0.00	Not applicable	Not relevant.
Municipal/industrial wastewater treatment plant	181.60	Higher	Our indirect wastewater discharge increased by approximately 2% in 2016, compared to 2015.
Wastewater for another organization	0.00	Not applicable	Not relevant.
Total	1837.88	Higher	Our total wastewater discharge increased approximately 2% in 2016, compared to 2015.

W1.2c

Water consumption: for the reporting year, please provide total water consumption data, across your operations

Consumption (megaliters/year)	How does this consumption figure compare to the last reporting year?	Comment
1449.71	Lower	Our total water consumption decreased 10% in 2016, compared to 2015 (1,616.58 megaliters).

W1.3

Do you request your suppliers to report on their water use, risks and/or management?

Yes

W1.3a

Please provide the proportion of suppliers you request to report on their water use, risks and/or management and the proportion of your procurement spend this represents

Proportion of suppliers %	Total procurement spend %	Rationale for this coverage
Less than 1%	Less than 1%	First Solar evaluates new suppliers using a balanced scorecard which focuses on the areas of Quality, Cost, Flexibility, Service, Technology and Sustainability. We recently expanded our supplier audit tool to include questions on water use and water reduction targets. We prioritize our engagement by focusing on our module and system component suppliers.The scorecard is a risk assessment tool used for supplier selection and ranks suppliers in terms of low, medium and high risk to determine whether further engagement or corrective actions are needed. We expect the proportion of suppliers engaged and the % of procurement spend they represent to increase as we continue to roll out our supplier audit tool.

W1.4

Has your organization experienced any detrimental impacts related to water in the reporting year?

No

Further Information

3 Module: Risk Assessment

3. Page: W2. Procedures and Requirements

W2.1

Does your organization undertake a water-related risk assessment?

Water risks are assessed

W2.2

Please select the options that best describe your procedures with regard to assessing water risks

Risk assessment procedure	Coverage	Scale	Please explain
Comprehensive company-wide risk assessment	Direct operations and supply chain	All facilities and some suppliers	Our facility risk scorecards assess water risks to our manufacturing facilities in the context of operational and/or business continuity on a semi-annual basis. Potential asset level water risks include natural disasters, utility supply disruption, and the inability to operate wastewater treatment plant or ultra pure water production. The level of coverage selected is prioritized according to a facility or supplier's ability to impact operations and business continuity. In addition to

Risk assessment procedure	Coverage	Scale	Please explain
			manufacturing thin film solar PV modules, we develop and construct utility-scale solar PV power plants. Success in developing a particular project is contingent upon, securing necessary water rights for project construction and operation, among other things. Water shortages could adversely affect, delay and/or render the successful completion of a particular project infeasible.

W2.3

Please state how frequently you undertake water risk assessments, at what geographical scale and how far into the future you consider risks for each assessment

Frequency	Geographic scale	How far into the future are risks considered?	Comment
Six-monthly or more frequently	Facility	1 to 3 years	On a semi-annual basis, our facility risk scorecards assess potential water risks to our manufacturing facilities in Ohio and Malaysia in the context of operational and/or business continuity.
Annually	Country	1 to 3 years	The development and construction of solar energy generation facilities and other energy infrastructure projects involve numerous risks which are outlined in our annual report. These include water risks which vary project by project. During construction, water is typically needed for site preparation and dust suppression. Ensuring access to water during the construction period is incorporated into our project development and permitting process.

W2.4

Have you evaluated how water risks could affect the success (viability, constraints) of your organization's growth strategy?

Yes, evaluated over the next 5 years

W2.4a

Please explain how your organization evaluated the effects of water risks on the success (viability, constraints) of your organization's growth strategy?

First Solar has implemented an enterprise risk management (ERM) system, which is led by the functional leaders. This team works from a top down approach to catalogue areas of risk to First Solar including areas such as regulatory risks, operational risks, reputational risks, market/customer changes, business continuity risks including due to weather and other extreme events, technology risks, supply chain, organizational adaptability.

Our facility risk scorecards assess water risks to our manufacturing facilities in the context of operational and/or business continuity on a semi-annual basis. Potential asset level water risks include natural disasters, utility supply disruption, and the inability to operate wastewater treatment plant or ultra pure water production. As we expand our manufacturing footprint to new countries, water scarcity and water resource availability are taken into account in the decision making process.

Our project development team identifies water risks associated with the development and construction of our utility-scale PV power plants. Water use during solar PV project construction is primarily used for site preparation and dust suppression, and varies by location and time of year. After construction, there is typically limited water use during PV system operation, with the potential exception of fire protection, minor sanitary use, landscaping, and module cleaning. First Solar modules do not require cleaning in most regions as dust is periodically removed by wind and rainfall.

W2.5

Please state the methods used to assess water risks

Method	Please explain how these methods are used in your risk assessment
Internal company knowledge Life Cycle Assessment WBCSD Global Water Tool WRI Aqueduct	Water-related project development risks are assessed based on internal company knowledge. Success in developing a particular project is contingent upon, securing necessary water rights for project construction and operation, among other things. The ease of finding water will vary project by project. The WBCSD Global Water Tool is used to assess water stress levels of countries where our manufacturing, recycling and R&D facilities are located. The WRI Aqueduct helps project future water basin stress levels for 2020, 2030 and 2040. A life cycle assessment was conducted to determine the amount of water consumed across the life cycle of First Solar PV modules and systems. Approximately half the life cycle water withdrawal of First Solar's CdTe PV technology is associated with module manufacturing, one-third with the balance of system, and the remainder with end-of-life recycling, with direct onsite water use representing only ~12% of CdTe PV's life cycle water withdrawal.

W2.6

Which of the following contextual issues are always factored into your organization's water risk assessments?

Issues	Choose option	Please explain
Current water availability and quality parameters at a local level	Relevant, included	Sufficient water availability and quality is taken into account when siting new manufacturing facilities as our manufacturing process relies on ultrapure water production. Our manufacturing risk scorecards assess potential risks to water availability at our current manufacturing sites. Securing sufficient water access for the construction of our utility-scale solar PV power plants is incorporated into our permitting and project development process.
Current water regulatory frameworks and tariffs at a local level	Relevant, included	We are subject to various national, state, local, and international laws and regulations relating to the protection of the environment, including those governing the discharge of pollutants into the air and water. Therefore, we could incur substantial costs, including cleanup costs, fines, and civil or criminal sanctions or liabilities under environmental and occupational health and safety laws and regulations or non-compliance with environmental permits required for our operations. We believe we are currently in substantial compliance with applicable environmental and occupational health and safety requirements and do not expect to incur material expenditures for environmental and occupational health and safety controls in the foreseeable future.
Current stakeholder conflicts concerning water resources at a local level	Relevant, included	Securing sufficient water access for the construction of our utility-scale solar PV power plants is incorporated into our project development process. Each First Solar project begins with an extensive review of potential site locations, and considers the available solar resources, proximity to existing electrical transmission lines, current land uses, site characteristics and

Issues	Choose option	Please explain
		environmental sensitivities. Stakeholder engagement is an integral part of First Solar's project development and community outreach activities. First Solar consults with neighbors, community groups, educational institutions, environmental groups, tribal representatives and business organizations to address local concerns and ensure the environmentally responsible design of our solar projects.
Current implications of water on your key commodities/raw materials	Relevant, included	First Solar conducted a life cycle assessment to understand the water impacts of our commodities and raw materials. The major contributors to our life cycle water withdrawal include grid electricity, glass, steel, copper, and inverters. Our manufacturing risk scorecards assess potential risks to water availability at our current manufacturing sites. Key raw materials not available for production are evaluated but are considered low risk.
Current status of ecosystems and habitats at a local level	Relevant, included	Each First Solar project begins with an extensive review of potential site locations, and considers the available solar resources, proximity to existing electrical transmission lines, current land uses, site characteristics and environmental sensitivities. Prior to being allowed admission to a project site, all workers and visitors are required to receive extensive site safety orientation training, which includes environmental and biological training. Although construction projects always involve some disturbance to existing land and wildlife habitats, responsibly developed PV power plants can create new habitats and help protect animal and plant species. Rainy weather at our California Flats project along with proper habitat protection during construction promoted emergence of fairy shrimp, a rare and federally protected endangered species, in certain vernal pools.
Current river basin management plans	Relevant, included	The expansion of our business is dependent on securing our water permits for withdrawals and discharges for new manufacturing and recycling sites so we factor local water availability into our risk assessments to ensure we understand any potential limitations or opportunities that may arise in relation to these plans. We use the WRI Aqueduct and WBCSD Global Water Tool to assess the stress level of current basins.
Current access to fully-functioning WASH services for all employees	Relevant, included	First Solar provides access to fully-functioning WASH services for all our associates. Hygienic conditions and a safe water supply is a requirement at all First Solar sites. All First Solar facilities monitor and track water use which is incorporated in First Solar's water inventory.
Estimates of future changes in water availability at a local level	Relevant, included	We use the WRI Aqueduct and WBCSD Global Water Tool to identify the river basins where we are most exposed to water risk and to estimate each basin's future stress levels. Our manufacturing risk scorecards assess potential risks to water availability at our current manufacturing sites including natural disasters, utility supply disruption, and the inability to operate wastewater treatment plant or ultra pure water production. Mitigation activities are identified and implemented to reduce the impacts of potential future risks.
Estimates of future potential regulatory changes at a local level	Relevant, included	We are subject to various national, state, local, and international laws and regulations relating to the protection of the environment, including those governing the discharge of pollutants into the air and water. Therefore, we could incur substantial costs, including cleanup costs, fines, and civil or criminal sanctions or liabilities under environmental and occupational health and safety laws and regulations or non-compliance with environmental permits required for our operations. Future developments such as the implementation of new, more stringent laws and regulations, more

Issues	Choose option	Please explain
		aggressive enforcement policies, or the discovery of unknown environmental conditions may require expenditures that could have a material adverse effect on our business, financial condition, or results of operations.
Estimates of future potential stakeholder conflicts at a local level	Relevant, included	Securing sufficient water access for the construction of our utility-scale solar PV power plants is incorporated into our project development process. Site characteristics and environmental sensitivities are taken into account before development and construction of a PV project can begin. Stakeholder engagement is an integral part of First Solar's project development and community outreach activities. We consult with neighbors, community groups, educational institutions, environmental groups, tribal representatives and business organizations to address local concerns, including access to water rights, especially in arid locations such as California.
Estimates of future implications of water on your key commodities/raw materials	Relevant, included	Our manufacturing risk scorecards assess potential risks to water availability at our current manufacturing sites. Our manufacturing facilities in Ohio and Malaysia depend on freshwater supply from the local utility. Mitigation activities have been identified for implementation to minimize disruption to manufacturing in the potential event of a water outage. Key raw materials not available for production is evaluated but is considered low risk.
Estimates of future potential changes in the status of ecosystems and habitats at a local level	Relevant, included	The life cycle impacts on biodiversity of a utility scale PV system have been evaluated over their 25+ year lifetime. First Solar is committed to responsible land use and works to minimize impacts during the construction and operation of our projects. We have worked with NGOs such as the World Wildlife Fund (WWF) to identify best practices for each stage of utility-scale PV power projects– from development, to construction and decommissioning. Site characteristics and environmental sensitivities are taken into account before development and construction of a PV project can begin. We strive to locate our projects in areas with the least conflicts.
Scenario analysis of availability of sufficient quantity and quality of water relevant for your operations at a local level	Relevant, included	Our manufacturing risk scorecards identify various risk scenarios which could impact water availability at our current manufacturing sites including natural disasters, utility supply disruption, and the inability to operate wastewater treatment plant or ultra pure water production. Mitigation activities are identified and implemented to reduce the impacts of potential future risks.
Scenario analysis of regulatory and/or tariff changes at a local level	Relevant, included	All First Solar facilities monitor and track water use and costs (both OPEX and CAPEX) which is incorporated in First Solar's water inventory.
Scenario analysis of stakeholder conflicts concerning water resources at a local level	Not evaluated	
Scenario analysis of implications of water on your key commodities/raw materials	Relevant, included	Our manufacturing risk scorecards various risk scenarios which could impact water availability at our current manufacturing sites, including utility water outage. Our manufacturing facilities in Ohio and Malaysia depend on freshwater supply from the local utility in order to operate. Mitigation activities have been identified for implementation to minimize disruption to manufacturing in the potential event of a water outage.
Scenario analysis of potential changes in the status of ecosystems and habitats at a local level	Relevant, included	The life cycle impacts on biodiversity of a utility scale PV system have been evaluated over their 25+ year lifetime. Overall, research has consistently found that when developed responsibly, ground-mounted solar PV power plants deliver significant environmental benefits. Replacing existing grid electricity with PV

Issues	Choose option	Please explain
		systems reduces greenhouse gas emissions, criteria pollutants, heavy metals, radioactive species, and reduces water withdrawal and consumption.
Other	Not relevant, explanation provided	There are no other relevant water risks.

W2.7

Which of the following stakeholders are always factored into your organization's water risk assessments?

Stakeholder	Choose option	Please explain
Customers	Relevant, included	While energy security and climate change have been important drivers for renewable energy adoption, water security provides an additional driver. The energy-water nexus associated with traditional energy sources is a growing concern among our customers particularly in water-stressed regions. First Solar modules convert sunlight into electricity without the use of water which provides an additional advantage over conventional energy and concentrated solar power. On a life cycle basis, First Solar's thin film modules use up to 300 times less water per MWh than conventional energy and up to 12 times less water than other solar technologies.
Employees	Relevant, included	First Solar provides access to fully-functioning WASH services for all our associates. Hygienic conditions and a safe water supply is a requirement at all First Solar sites. All First Solar facilities monitor and track water use which is incorporated in First Solar's water inventory.
Investors	Relevant, included	Socially responsible investors are interested in understanding our water risks and management strategy. We engage with investors through various surveys. We disclose water risks in our annual report and CDP Carbon and Water responses. We also provide insight into our water performance in our annual sustainability metrics and sustainability report.
Local communities	Relevant, included	Securing sufficient water access for the construction of our utility-scale solar PV power plants is incorporated into our permitting and project development process. Each First Solar project begins with an extensive review of potential site locations, and considers the available solar resources, proximity to existing electrical transmission lines, current land uses, site characteristics and environmental sensitivities. Stakeholder engagement is an integral part of First Solar's project development and community outreach activities. First Solar consults with neighbors, community groups, educational institutions, environmental groups, tribal representatives and business organizations to address local concerns and ensure the environmentally responsible design of our solar projects.
NGOs	Relevant, included	Securing sufficient water access for the construction of our utility-scale solar PV power plants is incorporated into our permitting and project development process. Each First Solar project begins with an extensive review of potential site locations, and considers the available solar resources, proximity to existing electrical transmission lines, current land uses, site characteristics and environmental sensitivities. Stakeholder engagement is an integral part of First Solar's project development and community outreach activities. First Solar consults with environmental groups to address local concerns and ensure the environmentally responsible design of our solar projects.
Other water users at a local level	Relevant, included	Securing sufficient water access for the construction of our utility-scale solar PV power plants is incorporated into our permitting and project development process. Each First Solar project begins with an extensive review of

Stakeholder	Choose option	Please explain
		potential site locations, and considers the available solar resources, proximity to existing electrical transmission lines, current land uses, site characteristics and environmental sensitivities. Stakeholder engagement is an integral part of First Solar's project development and community outreach activities. First Solar consults with neighbors, community groups, educational institutions, environmental groups, tribal representatives and business organizations to address local concerns and ensure the environmentally responsible design of our solar projects.
Regulators	Relevant, included	First Solar engages with regulators as part of the project permitting process to ensure sufficient access to water during the construction of a PV power plant.
River basin management authorities	Relevant, included	First Solar engages with river basin authorities as part of the project permitting process to ensure sufficient access to water during the construction of a PV power plant.
Statutory special interest groups at a local level	Relevant, included	First Solar engages with special interest groups at the local level as part of the project permitting process to ensure sufficient access to water during the construction of a PV power plant.
Suppliers	Relevant, included	We assess our suppliers' awareness of water risks through our supplier audit tool and include questions relating to their water reduction goals and monitoring practices.
Water utilities at a local level	Relevant, included	We engage with local water utilities to support our mitigation activities in the event of water outages.
Other	Not relevant, explanation provided	There are no other relevant stakeholders.

Further Information

4 Module: Implications

4. Page: W3. Water Risks

W3.1

Is your organization exposed to water risks, either current and/or future, that could generate a substantive change in your business, operations, revenue or expenditure?

Yes, direct operations and supply chain

W3.2

Please provide details as to how your organization defines substantive change in your business, operations, revenue or expenditure from water risk

Natural disasters such as floods and disruptions to our utility water supply that affect a plant's ability to produce and perform process development activities are water risks that could generate substantive change to our business. These risks would likely result in us losing some production for a while, until we are able to bring the affected buildings back to production. Substantive risk is defined in terms of its impact on our overall production. Of the 3.1GW produced in 2016, our manufacturing facility in Ohio represented approximately 17% while operations in Malaysia represent 83%.

In addition to manufacturing thin film solar photovoltaic modules, First Solar also develops, finances, engineers, constructs, and operates some of the world's largest PV power plants. The successful development and construction of solar energy generation facilities is contingent upon, securing necessary water rights for project construction and operation, among other things. Water shortages in regions where we develop and construct PV projects could adversely affect, delay and/or render the successful completion of a particular project infeasible.

W3.2a

Please provide the number of facilities* per river basin exposed to water risks that could generate a substantive change in your business, operations, revenue or expenditure; and the proportion of company-wide facilities this represents

Country	River basin	Number of facilities exposed to water risk	Proportion of company-wide facilities that this represents (%)	Comment
United States of America	St. Lawrence	1	11-20	First Solar's two manufacturing facilities are located in Perrysburg, Ohio and Kulim, Malaysia. First Solar has an additional recycling facility in Germany and two R&D facilities in the U.S.
Malaysia	Other: Muda River	1	11-20	First Solar's two manufacturing facilities are located in Perrysburg, Ohio and Kulim, Malaysia. First Solar has an additional recycling facility in Germany and two R&D facilities in the U.S.

W3.2b

For each river basin mentioned in W3.2a, please provide the proportion of the company's total financial value that could be affected by water risks

Country	River basin	Financial reporting metric	Proportion of chosen metric that could be affected	Comment
United States of America	St. Lawrence	% global production volume	11-20	Of the 3.1GW produced in 2016, our manufacturing facility in Ohio represented approximately 17%.
Malaysia	Other: Muda River	% global production volume	81-90	Of the 3.1 GW produced in 2016, our manufacturing facility in Malaysia represented approximately 83%.

W3.2c

Please list the inherent water risks that could generate a substantive change in your business, operations, revenue or expenditure, the potential impact to your direct operations and the strategies to mitigate them

Country	River basin	Risk driver	Potential impact	Description of potential impact	Timeframe	Likelihood	Magnitude of potential financial impact	Response strategy	Costs of response strategy	Details of strategy and costs
United States of America	St. Lawrence	Physical-Increased water stress Physical-Rationing of municipal water supply	Plant/production disruption leading to reduced output	Utility water outages due to increased water stress could disrupt plant operation in Ohio, resulting in decreased output. Of the 3.1GW produced in 2016, our manufacturing facility in Ohio represented approximately 17%.	1-3 years	Unlikely	Low	Supplier diversification	cost of response are part of our normal plant operational expenditures.	In the event of a water outage at our utility supplier, a tanker would be needed to transport water to our plant.
Malaysia	Other: Muda River	Physical-Increased water stress Physical-Rationing of municipal water supply	Plant/production disruption leading to reduced output	Utility water outages due to increased water stress could disrupt plant operation in Malaysia, resulting in decreased output. Of the 3.1 GW produced in 2016, our manufacturing facility in Malaysia represented approximately 83%.	1-3 years	Unlikely	High	Supplier diversification Other: Onsite water storage	cost of response are incorporated in our normal plant operational expenditures.	First Solar has onsite and offsite water storage to mitigate impacts in the event of utility water outages.

W3.2d

Please list the inherent water risks that could generate a substantive change in your business operations, revenue or expenditure, the potential impact to your supply chain and the strategies to mitigate them

Country	River basin	Risk driver	Potential impact	Description of potential impact	Timeframe	Likelihood	Magnitude of potential financial impact	Response strategy	Costs of response strategy	Details of strategy and costs
United States of America	St. Lawrence	Physical-Increased water stress Other: water outage at municipal utility	Water supply disruption	A water outage at our utility supplier would disrupt the supply of water to our manufacturing plant in Ohio. Of the 3.1GW produced in 2016, our manufacturing facility in Ohio represented approximately 17%.	1-3 years	Unlikely	Low	Supplier diversification	cost of response are part of our normal plant operational expenditures.	In the event of a water outage at our utility supplier, a tanker would be needed to transport water to our plant.
Malaysia	Other:	Physical-Increased water stress Other: water outage at municipal utility	Water supply disruption	A water outage at our utility supplier would disrupt the supply of water to our manufacturing plant in Malaysia. Of the 3.1 GW produced in 2016, our manufacturing facility in Malaysia represented approximately 83%.	1-3 years	Unlikely	High	Supplier diversification Other: storage	cost of response are part of our normal plant operational expenditures.	First Solar has onsite and offsite water storage to mitigate impacts in the event of utility water outages.

Further Information

5. Page: W4. Water Opportunities

W4.1

Does water present strategic, operational or market opportunities that substantively benefit/have the potential to benefit your organization?

Yes

W4.1a

Please describe the opportunities water presents to your organization and your strategies to realize them

Country or region	Opportunity	Strategy to realize opportunity	Estimated timeframe	Comment
Company-wide	Competitive advantage Other: Increased sale of products	While energy security and climate change have been important drivers for renewable energy adoption, water security provides an additional driver. The energy-water nexus associated with traditional energy sources is a growing concern particularly in water-stressed regions. Unlike thermal electric power plants and CSP, solar PV does not require any water to generate electricity during operation and is therefore ideally suited to meet the growing energy and water needs of arid, water-limited regions. In addition, First Solar's fully integrated thin film solar module manufacturing process requires less energy, water and semiconductor material than conventional crystalline silicon PV's batch manufacturing process. On a life cycle basis, First Solar's thin film modules use up to 300 times less water per MWh than conventional energy and up to 12 times less water than other solar technologies. Increased water demand and drought is generating a need for desalinating seawater which presents a new market opportunity for solar PV and First Solar in the Middle East and Australia. While conventional desalination is an	Current-up to 1 year	Although First Solar PV solutions are already competitive with conventional electricity generation sources in many regions on a levelized cost of electricity (LCOE) basis, solar PV becomes even more competitive on a total cost of electricity basis. Total cost electricity pricing accounts for all externalities by including environmental and performance adders such as life cycle pollutant emissions, water use, and variable power. On a total cost basis, First Solar thin film PV has the lowest energy pricing per MWh due to our low environmental impact and power plant controller capabilities which help reduce costs of variable power by regulating real and reactive power output from the PV plant. Total cost methodology provides an alternative framework to subsidies for recognizing the societal benefits of clean energy when choosing between technology options. (Source: P. Sinha, M. de Wild-Scholten, A. Wade, C. Breyer, Total Cost Electricity Pricing of Photovoltaics, SmartGreenScans, First Solar, and Renoir Lemoine Institute, 2013.)

Country or region	Opportunity	Strategy to realize opportunity	Estimated timeframe	Comment
		energy-intensive process, using PV to power the desalination process can decarbonize the process significantly. At the Greenough River Solar Farm in Australia, for example, First Solar PV modules are being used to offset the energy requirements of a desalination plant south of Perth.		

Further Information

5 Module: Accounting

6. Page: W5. Facility Level Water Accounting (I)

W5.1

Water withdrawals: for the reporting year, please complete the table below with water accounting data for all facilities included in your answer to W3.2a

Facility reference number	Country	River basin	Facility name	Total water withdrawals (megaliters/year) at this facility	How does the total water withdrawals at this facility compare to the last reporting year?	Please explain
Facility 1	United States of America	St. Lawrence	Perrysburg	420.49	Higher	Water withdrawals at our Perrysburg, Ohio manufacturing facility increased by approximately 8% in 2016 compared to 2015. This was primarily due to an increase in production.
Facility 2	Malaysia	Other: Muda River	Kulim	2857.84	Lower	Water withdrawals at our Kulim, Malaysia manufacturing facility decreased by approximately 5% in 2016 compared to 2015. The decrease in water withdrawals was due to water

Facility reference number	Country	River basin	Facility name	Total water withdrawals (megaliters/year) at this facility	How does the total water withdrawals at this facility compare to the last reporting year?	Please explain
						conservation and recycling initiatives implemented at our facility in Malaysia. By recycling rejected water from our purification system back into our raw water tank in 2016, our Kulim facility saved over 185 million liters of water.

Further Information

7. Page: W5. Facility Level Water Accounting (II)

W5.1a

Water withdrawals: for the reporting year, please provide withdrawal data, in megaliters per year, for the water sources used for all facilities reported in W5.1

Facility reference number	Fresh surface water	Brackish surface water/sea water	Rainwater	Groundwater (renewable)	Groundwater (non-renewable)	Produced/process water	Municipal water	Wastewater from another organization	Comment
Facility 1	0.00	0.00	0.00	0.00	0.00	0.00	420.49	0.00	100% of water withdrawal at our manufacturing facility in Ohio come from the municipal water utility. Absolute water

Facility reference number	Fresh surface water	Brackish surface water/sea water	Rainwater	Groundwater (renewable)	Groundwater (non-renewable)	Produced/process water	Municipal water	Wastewater from another organization	Comment
									withdrawal in Ohio increased by approximately 8% in 2016 from 389.89 megaliters in 2015. This was largely driven by the increase of our production volume in 2016.
Facility 2	0.00	0.00	0.00	0.00	0.00	0.00	2857.84	0.00	100% of water withdrawal at our manufacturing facility in Malaysia come from the municipal water utility. On an absolute basis, our water withdrawal in Malaysia decreased by 5% compared to 2015 (from 3,012.99 megaliters to 2,857.84 megaliters). By recycling rejected water

Facility reference number	Fresh surface water	Brackish surface water/sea water	Rainwater	Groundwater (renewable)	Groundwater (non-renewable)	Produced/process water	Municipal water	Wastewater from another organization	Comment
									from our purification system back into our raw water tank in 2016, our Kulim facility saved over 185 million liters of water.

W5.2

Water discharge: for the reporting year, please complete the table below with water accounting data for all facilities included in your answer to W3.2a

Facility reference number	Total water discharged (megaliters/year) at this facility	How does the total water discharged at this facility compare to the last reporting year?	Please explain
Facility 1	178.01	About the same	Water discharges at our manufacturing facility in Ohio increased approximately 2% in 2016, compared to 2015. This was largely driven by the increase of our production volume in 2016.
Facility 2	1656.28	About the same	Water discharges at our manufacturing facility in Malaysia increased approximately 2% in 2016, compared to 2015. This was largely driven by the increase of our production volume in 2016.

W5.2a

Water discharge: for the reporting year, please provide water discharge data, in megaliters per year, by destination for all facilities reported in W5.2

Facility reference number	Fresh surface water	Municipal/industrial wastewater treatment plant	Seawater	Groundwater	Wastewater for another organization	Comment
Facility 1	0.00	178.01	0.00	0.00	0.00	In 2016, 42% of the total water withdrawn (~420 megaliters) for our manufacturing facility was indirectly

Facility reference number	Fresh surface water	Municipal/industrial wastewater treatment plant	Seawater	Groundwater	Wastewater for another organization	Comment
						discharged to the municipal wastewater treatment plant from our industrial wastewater treatment system. The remaining 58% was used for irrigation, cooling towers, sanitary purposes, or recycled.
Facility 2	1656.28	0.00	0.00	0.00	0.00	In 2016, 58% of the total water withdrawn (~2,858 megaliters) for our manufacturing facility was directly discharged to river from our industrial wastewater treatment system in Malaysia. The remaining 42% was used for irrigation, cooling towers, sanitary purposes, or recycled.

W5.3

Water consumption: for the reporting year, please provide water consumption data for all facilities reported in W3.2a

Facility reference number	Consumption (megaliters/year)	How does this compare to the last reporting year?	Please explain
Facility 1	242.48	Higher	Water consumption at our manufacturing facility in Ohio increased by 12% in 2016 compared to 2015. This was largely driven by the increase of our production volume in 2016.
Facility 2	1201.56	Lower	Water consumption at our manufacturing facility in Malaysia decreased by 14% in 2016 compared to 2015. The decrease in water consumption was primarily due to water conservation and recycling initiatives implemented at our facility in Malaysia. By recycling rejected water from our purification system back into our raw water tank in 2016, our Kulim facility saved over 185 million liters of water. As a result, we decreased our water intensity per watt produced in Malaysia by 22% in 2016.

W5.4

For all facilities reported in W3.2a what proportion of their water accounting data has been externally verified?

Water aspect	% verification	What standard and methodology was used?
Water withdrawals- total volumes	Not verified	Our water inventory has not been verified externally yet.
Water withdrawals- volume by sources	Not verified	Our water inventory has not been verified externally yet.
Water discharges- total volumes	Not verified	Our water inventory has not been verified externally yet.
Water discharges- volume by destination	Not verified	Our water inventory has not been verified externally yet.
Water discharges- volume by treatment method	Not verified	Our water inventory has not been verified externally yet.
Water discharge quality data- quality by standard effluent parameters	Not verified	Our water inventory has not been verified externally yet.
Water consumption- total volume	Not verified	Our water inventory has not been verified externally yet.

Further Information

6 Module: Response

8. Page: W6. Governance and Strategy

W6.1

Who has the highest level of direct responsibility for water within your organization and how frequently are they briefed?

Highest level of direct responsibility for water issues	Frequency of briefings on water issues	Comment
Board of individuals/Sub-set of the Board or other committee appointed by the Board	Scheduled-quarterly	First Solar's Sustainability Council is composed of senior leaders from Supply Chain, Government Affairs, EHS, Sustainability, Business Development, Technology & Product Development, Legal, Human Resources, Finance, the SVP of Global Technical Services, as well as the Chief Operating Officer, the Chief Technology Officer, Chief Accounting Officer and the Chief Information Officer. The Sustainability Council promotes the implementation of cross-functional sustainability strategies and drives the company's sustainability goals, initiatives and programs with a focus on resource efficiency, supply chain risk management, transparency, and utilizing sustainability as a lever for growth. On a quarterly basis, the sustainability council is updated on the development and implementation of the company's resource efficiency strategy which includes water efficiency.

W6.2

Is water management integrated into your business strategy?

Yes

W6.2a

Please choose the option(s) below that best explains how water has positively influenced your business strategy

Influence of water on business strategy	Please explain
Water resource considerations are factored into location planning for new operations	As we expand our manufacturing footprint to new countries, water scarcity and water resource availability are taken into account in the decision making process. Our solar module manufacturing process relies on ultra pure water production so access to water is key to our operations.
Greater customer engagment	While energy security and climate change have been important drivers for renewable energy adoption, water security provides an additional driver. The energy-water nexus associated with traditional energy sources is a growing concern for our customers particularly in water-stressed regions. Unlike thermal electric power plants and CSP, solar PV does not require any water to generate electricity during operation and is therefore ideally suited to meet the growing energy and water needs of arid, water-limited regions. On a life cycle basis, First Solar's thin film modules have the lowest life cycle water use compared to other solar technologies and conventional energy generation. Increased water demand and drought is generating a need for desalinating seawater which presents a new market opportunity for solar PV and First Solar in the Middle East and Australia. While conventional desalination is an energy-intensive process, using PV to power the desalination process can decarbonize the process significantly. At the Greenough River Solar Farm in Australia, for example, First Solar PV modules are being used to offset the energy requirements of a desalination plant south of Perth. The facility displaces an estimated 20,000 tons of CO2 annually.
Introduction of water management KPIs	As part of our commitment to transparency, First Solar reports on a number of selected sustainability performance metrics including absolute water use, water intensity per watt produced, absolute wastewater generation, and wastewater generation intensity per watt produced. In addition to manufacturing PV modules with the lowest environmental impact in the industry, First Solar is committed to reducing the company's own operational impact. Since 2009, First Solar's manufacturing water intensity (water consumption per watt produced) has decreased nearly 45% due to significant improvements in module efficiency and manufacturing throughput along with water conservation and recycling projects.
Water resource considerations are factored into new product development	As we transition to our next generation Series 6 module technology, we are leveraging the opportunity to incorporate resource efficiency measures into new buildings and tool designs in order to manage our operational impacts. As a result of these measures, we anticipate our water intensity per watt produced will decrease compared to our Series 4 manufacturing process.
Exploration of environmental impact	First Solar conducted a life cycle water assessment of our thin film PV technology which concluded that the life cycle water withdrawal of cadmium telluride (CdTe) PV ranges from approximately 382– 425 L/MWh. (Source:Sinha, Meader and de Wild-Scholten, Life Cycle Water Usage in CdTe Photovoltaics, IEEE, Journal of Photovoltaics, 2012.) Direct onsite water use represents only ~12% of CdTe PV's life cycle water withdrawal. The remainder is related to indirect water withdrawal from the use of grid electricity and raw materials throughout the product life cycle. Primary contributors to life cycle water withdrawal in our supply chain include the use of grid electricity, glass, steel and copper production, chemical use, and transport during takeback and recycling. In addition, First Solar participated in the European Commission's Product Environmental Footprint pilot for solar PV. The pilot study is evaluating the environmental footprint of five different PV technologies (CdTe, CIS,

Influence of water on business strategy	Please explain
	micromorphous-Si, multicrystalline-Si, monocrystalline-Si) across 15 impact categories including water-related impacts such as acidification, freshwater eutrophication, water resource depletion, and freshwater ecotoxicity.
Other: Global charitable giving initiatives	First Solar partners with non-governmental organizations (NGOs) through our Global Charitable Giving Program to provide green education programs, financial contributions, training and expertise, as well as module donations aimed at providing access to clean energy and drinking water. We have community giving projects throughout the world including Australia, Chile, India, Malaysia, Thailand, Indonesia, Burkina Faso, South Africa, Germany, Nicaragua, Cameroon and the U.S.

W6.2b

Please choose the option(s) below that best explains how water has negatively influenced your business strategy

Influence of water on business strategy	Please explain
No measurable influence	First Solar’s fully integrated thin film solar module manufacturing process requires less energy, water and semiconductor material than conventional crystalline silicon PV module manufacturing. As a result we are less susceptible to negative water impacts on our operations and business strategy.

W6.3

Does your organization have a water policy that sets out clear goals and guidelines for action?

Yes

W6.3a

Please select the content that best describes your water policy (tick all that apply)

Content	Please explain why this content is included
Incorporated within group environmental, sustainability or EHS policy	First Solar's company-wide EHS policy contains a commitment to conserving natural resources (including water), minimizing waste, and preventing pollution from the manufacturing, construction, operation and end-of-life management of our PV products and installations.

W6.4

How does your organization's water-related capital expenditure (CAPEX) and operating expenditure (OPEX) during the most recent reporting year compare to the previous reporting year?

Water CAPEX (+/- % change)	Water OPEX (+/- % change)	Motivation for these changes
-93.88	+2.57	We did not have significant capital water expenditures in 2016. 2015 capital expenditures were primarily related to wastewater treatment facility upgrades.

Further Information

9. Page: W7. Compliance

W7.1

Was your organization subject to any penalties, fines and/or enforcement orders for breaches of abstraction licenses, discharge consents or other water and wastewater related regulations in the reporting year?

Yes, not significant

W7.1a

Please describe the penalties, fines and/or enforcement orders for breaches of abstraction licenses, discharge consents or other water and wastewater related regulations and your plans for resolving them

Facility name	Incident	Incident description	Frequency of occurrence in reporting year	Financial impact	Currency	Incident resolution
Perrysburg	Fine	Storm water pH was slightly too low and had to be rerouted to the wastewater treatment facility.	1	500	USD($)	A pipe was installed to reroute the storm water to the wastewater treatment facility.

W7.1b

What proportion of your total facilities/operations are associated with the incidents listed in W7.1a?

17%

W7.1c

Please indicate the total financial impacts of all incidents reported in W7.1a as a proportion of total operating expenditure (OPEX) for the reporting year. Please also provide a comparison of this proportion compared to the previous reporting year

Impact as % of OPEX	Comparison to last year
0.00	Higher

Further Information

10. Page: W8. Targets and Initiatives

W8.1

Do you have any company wide targets (quantitative) or goals (qualitative) related to water?

Yes, goals only

W8.1b

Please describe any company wide qualitative goals (ongoing or reached completion during the reporting period) and your progress in achieving these

Goal	Motivation	Description of goal	Progress
Other: resource efficiency	Cost savings	As part of our company-wide EHS policy, First Solar strives to conserve natural resources, minimize waste, protect biodiversity and native habitats, and prevent pollution from the manufacturing, construction, operation and end-of-life management of our PV products and installations.	Since 2009, First Solar's manufacturing water intensity (water consumption per watt produced) has decreased nearly 45 percent due to significant improvements in module efficiency and manufacturing throughput along with water conservation and recycling projects. By recycling rejected water from our purification system back into our raw water tank in Malaysia, we saved over 185 million liters of water. That's equivalent to 74 Olympic-sized swimming pools! As a result, our water intensity per watt produced in 2016 decreased by approximately 23% (from 1.37 liters per watt in 2015 to 1.06 liters per watt in 2016). Overall, First Solar's absolute water withdrawal decreased by approximately 4 percent from 3.43 billion liters in 2015 to 3.28 billion liters in 2016, while our production volume increased by 24 percent in 2016.

Further Information

7 Module: Linkages/Tradeoff

11. Page: W9. Managing trade-offs between water and other environmental issues

W9.1

Has your organization identified any linkages or trade-offs between water and other environmental issues in its value chain?

Yes

W9.1a

Please describe the linkages or trade-offs and the related management policy or action

Environmental issues	Linkage or trade-off	Policy or action
The energy-water nexus	Linkage	The energy-water nexus associated with traditional energy sources is a growing concern particularly in water-stressed regions. According to the International Energy Agency, the energy sector accounts for 10 percent of global water withdrawals. A 2014 United Nations World Water Development report predicts that electricity generation could account for more than one-third of global water withdrawals by 2035. Unlike conventional energy generation, renewable energy sources such as solar PV systems do not require fuel processing and associated water inputs to generate electricity and are consequently more resilient to extreme weather events and severe droughts than hydro and thermoelectric. Solar PV systems can improve access to and sustainability of water supply for agriculture and other uses.
Carbon management-Decarbonizing desalination	Linkage	Increased water demand and drought is generating a need for desalinating seawater which presents a new market opportunity for solar PV and First Solar in the Middle East and Australia. While conventional desalination is an energy-intensive process, using PV to power the desalination process can decarbonize the process significantly. At the Greenough River Solar Farm in Australia, for example, First Solar PV modules are being used to offset the energy requirements of a desalination plant south of Perth. The facility displaces an estimated 20,000 tons of CO2 annually.

Further Information

8 Module: Sign Off

12. Page: Sign Off

W10.1

Please provide the following information for the person that has signed off (approved) your CDP water response

Name	Job title	Corresponding job category
Alex Heard	Senior Vice President, Global Technical Services	Environment/Sustainability manager

W10.2

Please indicate that your organization agrees for CDP to transfer your publicly disclosed data regarding your response strategies to the CEO Water Mandate Water Action Hub.

Note: Only your responses to W1.4a (response to impacts) and W3.2c&d (response to risks) will be shared and then reviewed as a potential collective action project for inclusion on the WAH website.

By selecting Yes, you agree that CDP may also share the email address of your registered CDP user with the CEO Water Mandate. This will allow the Hub administrator to alert your company if its response data includes a project of potential interest to other parties using water resources in the geographies in which you operate.

The Hub will publish the project with the associated contact details. Your company will be provided with a secure log-in allowing it to amend the project profile and contact details.

Yes

Further Information

CDP: [D][-,-][D2]