SUSTAINABILITY ACCOUNTING STANDARD
RENEWABLE RESOURCES & ALTERNATIVE ENERGY SECTOR

SOLAR ENERGY

Sustainability Accounting Standard

Sustainable Industry Classification System™ (SICS™) #RR0102

Prepared by the
Sustainability Accounting Standards Board®

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Provisional Standard

SOLAR ENERGY

Sustainability Accounting Standard

About SASB

The Sustainability Accounting Standards Board (SASB) provides sustainability accounting standards for use by publicly-listed corporations in the U.S. in disclosing material sustainability information for the benefit of investors and the public. SASB standards are designed for disclosure in mandatory filings to the Securities and Exchange Commission (SEC), such as the Form 10-K and 20-F. SASB is an independent 501(c)3 non-profit organization. Through 2016, SASB is developing standards for 79 industries in 10 sectors.

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INTRODUCTION

Purpose & Structure

This document contains the SASB Sustainability Accounting Standard (SASB Standard) for the Solar Energy industry.

SASB Sustainability Accounting Standards are comprised of **(1) disclosure guidance and (2) accounting standards on sustainability topics** for use by U.S. and foreign public companies in their annual filings (Form 10-K or 20-F) with the U.S. Securities and Exchange Commission (SEC). To the extent relevant, SASB Standards may also be applicable to other periodic mandatory filings with the SEC, such as the Form 10-Q, Form S-1, and Form 8-K.

SASB Standards identify sustainability topics at an industry level, which may constitute material information—depending on a company's specific operating context—for a company within that industry. SASB Standards are intended to provide guidance to company management, which is ultimately responsible for determining which information is material and should therefore be included in its Form 10-K or 20-F and other periodic SEC filings.

SASB Standards provide companies with standardized sustainability metrics designed to communicate performance on industry level sustainability topics. When making disclosure on sustainability topics, companies can use SASB Standards to help ensure that disclosure is standardized and therefore decision-useful, relevant, comparable, and complete.

SASB Standards are intended to constitute "suitable criteria" as defined by AT 101.23–.32[1] and referenced in AT 701[2], as having the following attributes:

- *Objectivity*—Criteria should be free from bias.
- *Measurability*—Criteria should permit reasonably consistent measurements, qualitative or quantitative, of subject matter.
- *Completeness*—Criteria should be sufficiently complete so that those relevant factors that would alter a conclusion about subject matter are not omitted.
- *Relevance*—Criteria should be relevant to the subject matter.

Industry Description

The Solar Energy industry comprises companies that manufacture solar energy equipment, including solar photovoltaic (PV) modules, polysilicon feedstock, solar thermal electricity-generation systems, solar inverters, and other related components. Companies may also develop, build, and manage solar energy projects and offer financing or maintenance services to customers. Two primary technologies are utilized in the industry: PV, which accounts for the majority of the projects and thus is the focus of the SASB standard; and concentrated solar (CSP).

[1] http://pcaobus.org/Standards/Attestation/Pages/AT101.aspx#at_101_fn7
[2] http://pcaobus.org/Standards/Attestation/Pages/AT701.aspx

Within solar PV there are two main technologies: crystalline silicon-based solar and thin-film solar, which includes panels made from copper indium gallium selenide and cadmium telluride. The primary markets for solar panels are residential, non-residential (commercial and industrial), and utility-scale projects. Companies in the industry operate globally.

Guidance for Disclosure of Sustainability Topics in SEC Filings

1. Industry-Level Sustainability Topics

For the Solar Energy industry, SASB has identified the following sustainability disclosure topics:

- Energy Management in Manufacturing
- Water Management in Manufacturing
- Hazardous Materials Management
- Community & Ecological Impacts of Project Development
- Management of Energy Infrastructure Integration & Related Regulations
- Product Lifecycle Environmental Impacts
- Materials Sourcing

2. Company-Level Determination and Disclosure of Material Sustainability Topics

Sustainability disclosures are governed by the same laws and regulations that govern disclosures by securities issuers generally. According to the U.S. Supreme Court, a fact is material if, in the event such fact is omitted from a particular disclosure, there is "a substantial likelihood that the disclosure of the omitted fact would have been viewed by the reasonable investor as having significantly altered the 'total mix' of the information made available."[3,4]

SASB has attempted to identify those sustainability topics that are reasonably likely to have a material effect on the financial condition or operating performance of companies within each SICS industry. SASB recognizes, however, that each company is ultimately responsible for determining what information should be disclosed within the context of Regulation S-K and other guidance.

Regulation S-K, which sets forth certain disclosure requirements associated with Form 10-K and other SEC filings, requires companies, among other things, to describe in the Management's Discussion and Analysis of Financial Condition and Results of Operations (MD&A) section of Form 10-K "any known trends or uncertainties that have had or that the registrant reasonably expects will have a material favorable or unfavorable impact on net sales or revenues or income from continuing operations. If the registrant knows of events that will cause a material change in the relationship between costs and revenues (such as known future increases in costs of labor or materials or price increases or inventory adjustments), the change in the relationship shall be disclosed."

[3] TSC Industries v. Northway, Inc., 426 U.S. 438 (1976).
[4] C.F.R. 229.303(Item 303)(a)(3)(ii).

Furthermore, Instructions to Item 303 state that the MD&A "shall focus specifically on material events and uncertainties known to management that would cause reported financial information not to be necessarily indicative of future operating results or of future financial condition."[2]

The SEC has provided guidance for companies to use in determining whether a trend or uncertainty should be disclosed. The two-part assessment prescribed by the SEC, based on probability and magnitude, can be applied to the topics included within this standard:

- First, a company is not required to make disclosure about a known trend or uncertainty if its management determines that such trend or uncertainty is not reasonably likely to occur.

- Second, if a company's management cannot make a reasonable determination of the likelihood of an event or uncertainty, then disclosure is required unless management determines that a material effect on the registrant's financial condition or results of operation is not reasonably likely to occur.

3. Sustainability Accounting Standard Disclosures in Form 10-K

a. Management's Discussion and Analysis

For purposes of comparability and usability, companies should consider making disclosure on sustainability topics in the MD&A, in a sub-section titled **"Sustainability Accounting Standards Disclosures."**[5]

b. Other Relevant Sections of Form 10-K

In addition to the MD&A section, it may be relevant for companies to disclose sustainability information in other sections of Form 10-K, including, but not limited to:

- **Description of business**—Item 101 of Regulation S-K requires a company to provide a description of its business and its subsidiaries. Item 101(c)(1)(xii) expressly requires disclosure regarding certain costs of complying with environmental laws:

Appropriate disclosure also shall be made as to the material effects that compliance with Federal, State and local provisions which have been enacted or adopted regulating the discharge of materials into the environment, or otherwise relating to the protection of the environment, may have upon the capital expenditures, earnings and competitive position of the registrant and its subsidiaries.

- **Legal proceedings**—Item 103 of Regulation S-K requires companies to describe briefly any material pending or contemplated legal proceedings. Instructions to Item 103 provide specific disclosure requirements for administrative or judicial proceedings arising from laws and regulations that target discharge of materials into the environment or that are primarily for the purpose of protecting the environment.

[5] SEC [Release Nos. 33-8056; 34-45321; FR-61] Commission Statement about Management's Discussion and Analysis of Financial Condition and Results of Operations: "We also want to remind registrants that disclosure must be both useful and understandable. That is, management should provide the most relevant information and provide it using language and formats that investors can be expected to understand. Registrants should be aware also that investors will often find information relating to a particular matter more meaningful if it is disclosed in a single location, rather than presented in a fragmented manner throughout the filing."

- **Risk factors**—Item 503(c) of Regulation S-K requires filing companies to provide a discussion of the most significant factors that make an investment in the registrant speculative or risky, clearly stating the risk and specifying how a particular risk affects the particular filing company.

c. Rule 12b-20

Securities Act Rule 408 and Exchange Act Rule 12b-20 require a registrant to disclose, in addition to the information expressly required by law or regulation, "such further material information, if any, as may be necessary to make the required statements, in light of the circumstances under which they are made, not misleading."

More detailed guidance on disclosure of material sustainability topics can be found in the **SASB Conceptual Framework**, available for download via http://www.sasb.org/approach/conceptual-framework/.

Guidance on Accounting for Sustainability Topics

For each sustainability topic included in the Solar Energy industry Sustainability Accounting Standard, SASB identifies accounting metrics.

SASB recommends that each company consider using these sustainability accounting metrics when preparing disclosures on the sustainability topics identified herein.

As appropriate—and consistent with Rule 12b-20[6]—when disclosing a sustainability topic identified by this Standard, companies should consider including a narrative description of any material factors necessary to ensure completeness, accuracy, and comparability of the data reported. Where not addressed by the specific accounting metrics, but relevant, the registrant should discuss the following, related to the topic:

- The registrant's **strategic approach** to managing performance on material sustainability issues;
- The registrant's **relative performance** with respect to its peers;
- The **degree of control** the registrant has;
- Any measures the registrant has undertaken or plans to undertake to improve performance; and
- Data for the registrant's **last three completed fiscal years** (when available).

SASB recommends that registrants use SASB Standards specific to their primary industry as identified in the Sustainable Industry Classification System (SICS™). If a registrant generates significant revenue from multiple industries, SASB recommends that it also consider sustainability topics that SASB has identified for those industries and disclose the associated SASB accounting metrics.

[6] SEC Rule 12b-20: "In addition to the information expressly required to be included in a statement or report, there shall be added such further material information, if any, as may be necessary to make the required statements, in the light of the circumstances under which they are made, not misleading."

In disclosing to SASB Standards, it is expected that registrants disclose with the same level of rigor, accuracy, and responsibility as they apply to all other information contained in their SEC filings.

Users of the SASB Standards

The SASB Standards are intended to provide guidance for companies that engage in public offerings of securities registered under the Securities Act of 1933 (the Securities Act) and those that issue securities registered under the Securities Exchange Act of 1934 (the Exchange Act),[7] for use in SEC filings, including, without limitation, annual reports on Form 10-K (Form 20-F for foreign issuers), quarterly reports on Form 10-Q, current reports on Form 8-K, and registration statements on Forms S-1 and S-3. Disclosure with respect to the SASB Standards is not required or endorsed by the SEC or other entities governing financial reporting, such as FASB, GASB, or IASB.

Scope of Disclosure

Unless otherwise specified, SASB recommends:

- That a registrant disclose on sustainability issues and metrics for itself and for entities that are consolidated for financial reporting purposes as defined by accounting principles generally accepted in the United States for consistency with other accompanying information within SEC filings;[8]
- That for consolidated entities, disclosures be made, and accounting metrics calculated, for the whole entity, regardless of the size of the minority interest; and
- That information from unconsolidated entities not be included in the computation of SASB accounting metrics. A registrant should disclose, however, information about unconsolidated entities to the extent that the registrant considers the information necessary for investors to understand the effect of sustainability topics on the company's financial condition or operating performance (typically, this disclosure would be limited to risks and opportunities associated with these entities).

Reporting Format

Use of Financial Data

In instances where accounting metrics, activity metrics, and technical protocols in this standard incorporate financial data (e.g., revenues, cost of sales, expenses recorded and disclosed for fines, etc.), such financial data shall be prepared in accordance with the accounting principles generally accepted in the United States of America ("US GAAP") and be consistent with the corresponding financial data reported within the registrant's SEC filings. Should accounting metrics, activity metrics and technical protocols in this standard incorporate disclosure of financial data

[7] Registration under the Securities Exchange Act of 1934 is required (1) for securities to be listed on a national securities exchange such as the New York Stock Exchange, the NYSE Amex, and the NASDAQ Stock Market or (2) if (A) the securities are equity securities and are held by more than 2,000 persons (or 500 persons who are not accredited investors) and (B) the company has more than $10 million in assets.

[8] See US GAAP consolidation rules (Section 810).

that is not prepared in accordance with US GAAP, the registrant shall disclose such information in accordance with the SEC Regulation G.

Activity Metrics and Normalization

SASB recognizes that normalizing accounting metrics is important for the analysis of SASB disclosures.

SASB recommends that a registrant disclose any basic business data that may assist in the accurate evaluation and comparability of disclosure, to the extent that they are not already disclosed in the Form 10-K (e.g., revenue, EBITDA, etc.).

Such data—termed "activity metrics"—may include high-level business data such as total number of employees, quantity of products produced or services provided, number of facilities, or number of customers. It may also include industry-specific data such as plant capacity utilization (e.g., for specialty chemical companies), number of transactions (e.g., for Internet media and services companies), hospital bed days (e.g., for health care delivery companies), or proven and probable reserves (e.g., for oil and gas exploration and production companies).

Activity metrics disclosed should:

- Convey contextual information that would not otherwise be apparent from SASB accounting metrics.
- Be deemed generally useful for an investor relying on SASB accounting metrics in performing their own calculations and creating their own ratios.
- Be explained and consistently disclosed from period to period to the extent they continue to be relevant. However, a decision to make a voluntary disclosure in one period does not obligate a continuation of that disclosure if it is no longer relevant or if a better metric becomes available.[9]

Where relevant, SASB recommends specific activity metrics that—at a minimum—should accompany SASB accounting metric disclosures.

ACTIVITY METRIC	CATEGORY	UNIT OF MEASURE	CODE
Total capacity of photovoltaic (PV) solar modules sold[10]	Quantitative	Megawatts (MW)	RR0102-A
Total capacity of photovoltaic (PV) solar modules produced[11]	Quantitative	Megawatts (MW)	RR0102-B
Total capacity of completed solar energy systems[12]	Quantitative	Megawatts (MW)	RR0102-C
Total project development assets[13]	Quantitative	U.S. Dollars ($)	RR0102-D

[9] *Improving Business Reporting: Insights into Enhancing Voluntary Disclosures*, FASB Business Reporting Research Project, January 29, 2001.
[10] Note to **RR0102-A**—PV solar modules are defined in accordance with the U.S. Department of Energy (DOE) Solar Energy Glossary: photovoltaic (PV) module.
[11] Note to **RR0102-B**—PV solar modules are defined in accordance with the U.S. DOE Solar Energy Glossary: photovoltaic (PV) module.
[12] Note to **RR0102-C**—Solar energy systems are defined as any system that converts sunlight into electrical energy, in accordance with the U.S. DOE Solar Energy Glossary, including, but not limited to, "photovoltaic (PV) system" and "solar thermal electric systems." Completed systems are defined by the registrant, consistent with its existing public disclosure of completed systems.
[13] Note to **RR0102-D**—Project development assets are defined by the registrant, consistent with its existing public disclosure of project development assets, regardless of terminology used by the registrant (e.g., "Project assets," "Project assets—plants and land," "Solar

Units of Measure

Unless specified, disclosures should be reported in International System of Units (SI units).

Uncertainty

SASB recognizes that there may be inherent uncertainty when disclosing certain sustainability data and information. This may be related to variables such as the reliance on data from third-party reporting systems and technologies, or the unpredictable nature of climate events. Where uncertainty around a particular disclosure exists, SASB recommends that the registrant should consider discussing its nature and likelihood.

Estimates

SASB recognizes that scientifically based estimates, such as the reliance on certain conversion factors or the exclusion of *de minimis* values, may occur for certain quantitative disclosures. Where appropriate, SASB does not discourage the use of such estimates. When using an estimate for a particular disclosure, SASB expects that the registrant discuss its nature and substantiate its basis.

Timing

Unless otherwise specified, disclosure shall be for the registrant's fiscal year.

Limitations

There is no guarantee that SASB Standards address all sustainability impacts or opportunities associated with a sector, industry, or company, and therefore, a company must determine for itself the topics—sustainability-related or otherwise—that warrant discussion in its SEC filings.

Disclosure under SASB Standards is voluntary. It is not intended to replace any legal or regulatory requirements that may be applicable to user operations. Where such laws or regulations address legal or regulatory topics, disclosure under SASB Standards is not meant to supersede those requirements. Disclosure according to SASB Standards shall not be construed as demonstration of compliance with any law, regulation, or other requirement.

SASB Standards are intended to be aligned with the principles of materiality enforced by the SEC. However, SASB is not affiliated with or endorsed by the SEC or other entities governing financial reporting, such as FASB, GASB, or IASB.

Forward-Looking Statements

Disclosures on sustainability topics can involve discussion of future trends and uncertainties related to the registrant's operations and financial condition, including those influenced by external variables (e.g., environmental,

Energy Systems Held for Development and Sale," etc.). At a minimum, project development assets include assets that are associated with solar energy systems that are under development or fully developed, owned by the registrant, and held for sale or intended to be sold to a third party prior to the execution of a definitive sales agreement, and assets that consist primarily of capitalized costs incurred in connection with the development of solar energy systems.

social, regulatory, and political). Companies making such disclosures should familiarize themselves with the safe harbor provisions of Section 27A of the Securities Act and Section 21E of the Exchange Act, which preclude civil liability for material misstatements or omissions in such statements if the registrant takes certain steps, including, among other things, identifying the disclosure as "forward-looking" and accompanying such disclosure with "meaningful cautionary statements identifying important factors that could cause actual results to differ materially from those in the forward-looking statements."

The following sections contain the disclosure guidance associated with each accounting metric such as guidance on definitions, scope, accounting, compilation, and presentation.

The term "shall" is used throughout this document to indicate those elements that reflect requirements of the Standard. The terms "should" and "may" are used to indicate guidance, which, although not required, provides a recommended means of disclosure.

Table 1. Sustainability Disclosure Topics & Accounting Metrics

TOPIC	ACCOUNTING METRIC	CATEGORY	UNIT OF MEASURE	CODE
Energy Management in Manufacturing	Total energy consumed, percentage grid electricity, percentage renewable	Quantitative	Gigajoules (GJ), Percentage (%)	RR0102-01
Water Management in Manufacturing	(1) Total water withdrawn and (2) total water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress	Quantitative	Cubic meters (m^3), Percentage (%)	RR0102-02
	Discussion of water management risks and description of strategies and practices to mitigate those risks	Discussion and Analysis	n/a	RR0102-03
Hazardous Materials Management	Amount of hazardous waste, percentage recycled	Quantitative	Metric tons (t), Percentage (%)	RR0102-04
	Number and aggregate quantity of reportable spills, quantity recovered[14]	Quantitative	Number, Kilograms (kg)	RR0102-05
Community & Ecological Impacts of Project Development	Project development asset impairments associated with community or ecological impacts	Quantitative	U.S. Dollars ($)	RR0102-06
	Description of efforts in solar energy system project development to address community and ecological impacts	Discussion and Analysis	n/a	RR0102-07
Management of Energy Infrastructure Integration & Related Regulations	Average price of solar energy (1) photovoltaic (PV) modules and (2) completed utility-scale systems	Quantitative	U.S. Dollars per watt ($/W)	RR0102-08
	Description of risks associated with integration of solar energy into existing energy infrastructure and discussion of efforts to manage those risks	Discussion and Analysis	n/a	RR0102-09
	Discussion of risks and opportunities associated with energy policy and its impact on the integration of solar energy into existing energy infrastructure	Discussion and Analysis	n/a	RR0102-10

[14] Note to **RR0102-05**—The registrant shall discuss its long-term activities to remediate spills that occurred in years prior to the reporting period but for which remediation activities are ongoing.

Table 1. Sustainability Disclosure Topics & Accounting Metrics (cont.)

TOPIC	ACCOUNTING METRIC	CATEGORY	UNIT OF MEASURE	CODE
Product Lifecycle Environmental Impacts	Percentage of products sold that are recyclable or reusable	Quantitative	Percentage (%)	RR0102-11
	Weight of end-of-life material recovered, percentage of recovered materials that are recycled	Quantitative	Metric tons (t), Percentage (%)	RR0102-12
	Discussion of approach to manage use, reclamation, and disposal of hazardous materials	Discussion and Analysis	n/a	RR0102-13
Materials Sourcing	Percentage of tungsten, tin, tantalum, and gold smelters within the supply chain that are verified conflict-free	Quantitative	Percentage (%)	RR0102-14
	Discussion of the management of risks associated with the use of conflict minerals	Discussion and Analysis	n/a	RR0102-15
	Discussion of the management of environmental risks associated with the polysilicon supply chain	Discussion and Analysis	n/a	RR0102-16

Energy Management in Manufacturing

Description

Solar panel manufacturing requires significant use of electricity. It is typically purchased from the grid and can account for a considerable share of the total cost of materials. Climate change regulations and growing energy demand are contributing to rising prices for conventional electricity sources. It is therefore increasingly important for companies in energy-intensive industries to manage their overall energy efficiency. Additionally, companies that diversify their energy sources will be better able to manage the associated risks and maintain a reliable energy supply, which could be particularly relevant in emerging markets. Thin-film solar does not involve the silicon-purifying process, which is energy-intensive, meaning that it has lower energy requirements and generally a relatively lower price. Companies that minimize their energy costs through effective energy management can gain a competitive advantage through operational efficiency and competitive pricing of products. This is particularly important given the low margins and intense price competition of solar energy companies. Companies may obtain the additional reputational benefit of lowering energy payback time, which is the amount of time needed for a panel to produce the energy it took to manufacture it.

Accounting Metrics

RR0102-01. Total energy consumed, percentage grid electricity, percentage renewable

.01 The registrant shall disclose total energy consumption from all sources as an aggregate figure in gigajoules or their multiples.

- The scope includes energy purchased from sources external to the organization or produced by the organization itself (self-generated).
- The scope includes only energy consumed by entities owned or controlled by the organization.
- The scope includes energy from all sources including direct fuel usage, purchased electricity, and heating, cooling, and steam energy.

.02 In calculating energy consumption from fuels and biofuels, the registrant shall use higher heating values (HHV), also known as gross calorific values (GCV), which are directly measured or taken from the Intergovernmental Panel on Climate Change (IPCC), the U.S. Department of Energy (DOE), or the U.S. Energy Information Administration (EIA).

.03 The registrant shall disclose purchased grid electricity consumption as a percentage of its total energy consumption.

.04 The registrant shall disclose renewable energy consumption as a percentage of its total energy consumption.

.05 The scope of renewable energy includes renewable fuel the registrant consumes and renewable energy the registrant directly produces, purchases through a renewable power purchase agreement (PPA) that explicitly includes renewable energy certificates (RECs), or for which Green-e Energy Certified RECs are paired with grid electricity.

- For any renewable electricity generated on-site, any RECs must be retained (i.e., not sold) and retired on behalf of the registrant in order for the registrant to claim them as renewable energy.
- For renewable PPAs, the agreement must explicitly include and convey that RECs be retained and retired on behalf of the registrant in order for the registrant to claim them as renewable energy.
- The renewable portion of the electricity grid mix that is outside of the control or influence of the registrant is excluded from disclosure.[15]
- Renewable energy is defined as energy from sources that are replenished at a rate greater than or equal to their rate of depletion, consistent with the U.S. Environmental Protection Agency's (EPA) definitions, such as geothermal, wind, solar, hydro, and biomass.

.06 For the purposes of this disclosure, the scope of renewable energy from hydro sources is limited to those that are certified by the Low Impact Hydropower Institute or are eligible for a state Renewable Portfolio Standard.

.07 For the purposes of this disclosure, the scope of renewable energy from biomass sources is limited to the following:

- Energy from biomass sources that meets at least one of the following criteria:
  - Certification to a third-party standard (e.g., Forest Stewardship Council, Sustainable Forest Initiative, Programme for the Endorsement of Forest Certification, or American Tree Farm System);
  - Classification as an "eligible renewable" according to the Green-e Energy National Standard Version 2.5 (2014); or
  - Eligibility for a state Renewable Portfolio Standard.

.08 The registrant shall apply conversion factors consistently for all data reported under this disclosure, such as the use of HHVs for fuel usage (including biofuels) and conversion of kWh to gigajoules (for energy data including electricity from solar or wind energy).

.09 The registrant may choose to disclose the amount of energy that it generates in excess of what it consumes and is net metered through an electric utility.

[15] SASB recognizes that RECs reflect the environmental attributes of renewable energy that have been introduced to the grid.

Water Management in Manufacturing

Description

Solar PV panel manufacturing can be water-intensive, and ultra-pure water can be a critical input in some processes. The manufacturing process can also generate high volumes of contaminated wastewater, which must be treated before disposal or reuse. Wastewater treatment and disposal can result in high operating costs and additional capital expenditures. The contamination of local water resources is a risk that can generate tension with local water users, potentially disrupting manufacturing operations, and can adversely impact brand value. Depending on their location, solar manufacturing facilities may be exposed to the risk of reduced water availability and related cost increases or operational disruption, as water is becoming a scarce resource around the world. To address water supply and treatment issues, companies can adopt various strategies such as recycling process water, improving production techniques to lower water intensity, and installing water treatment systems to preempt more-stringent water-effluent regulations.

Accounting Metrics

RR0102-02. (1) Total water withdrawn and (2) total water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress

.10 The registrant shall disclose the amount of water (in thousands of cubic meters) that was withdrawn from all sources, where:

- Water sources include surface water (including water from wetlands, rivers, lakes, and oceans), groundwater, rainwater collected directly and stored by the registrant, wastewater obtained from other entities, municipal water supplies, or other water utilities.
- Disclosure corresponds to CDP Water Questionnaire W1.2a.

.11 The registrant may choose to disclose the portion of its supply by source if, for example, significant portions of withdrawals are from non-freshwater sources, where:

- Fresh water may be defined according to the local statutes and regulations where the registrant operates. Where there is no regulatory definition, fresh water shall be considered to be water that has a solids (TDS) concentration of less than 1000 mg/l per the Water Quality Association definition.
- Water obtained from a water utility in compliance with U.S. National Primary Drinking Water Regulations can be assumed to meet the definition of fresh water.

.12 The registrant shall disclose the amount of water (in thousands of cubic meters) that was consumed in its operations, where water consumption is defined as:

- Water that evaporates during withdrawal, usage, and discharge;
- Water that is directly or indirectly incorporated into the registrant's product or service; and

- Water that does not otherwise return to the same catchment area from which it was withdrawn, such as water returned to another catchment area or the sea.

- Disclosure corresponds to CDP Water Questionnaire W1.2c.

.13 The registrant shall analyze all of its operations for water risks and identify activities that withdraw and consume water in locations with High (40–80%) or Extremely High (>80%) Baseline Water Stress as classified by the World Resources Institute's (WRI) Water Risk Atlas tool, Aqueduct (publicly accessible online here).

.14 The registrant shall disclose its water withdrawn in locations with High or Extremely High Baseline Water Stress as a percentage of the total water withdrawn.

.15 The registrant shall disclose its water consumed in locations with High or Extremely High Baseline Water Stress as a percentage of the total water consumed.

RR0102-03. Discussion of water management risks and description of strategies and practices to mitigate those risks

.16 The registrant shall discuss its risks associated with water withdrawals, water consumption, and discharge of water to the environment and describe how it manages these risks.

- Disclosure corresponds to CDP Water Questionnaire W3.1 and W3.2c.

.17 The registrant shall discuss, where applicable, risks to the availability of adequate, clean water resources.

- Relevant information to provide includes, but is not limited to:

  - Environmental constraints, such as operating in water-stressed regions, drought, interannual or seasonal variability, and risks due to the impact of climate change.

  - External constraints, such as volatility in water costs, stakeholder perceptions and concerns related to water withdrawals (e.g., those from local communities, non-governmental organizations, and regulatory agencies), direct competition with and impact from the actions of other users (commercial and municipal), restrictions to withdrawals due to regulations, and constraints on the registrant's ability to obtain and retain water rights or permits.

  - How risks may vary by withdrawal source, including wetlands, rivers, lakes, oceans, groundwater, rainwater, municipal water supplies, or supply from other water utilities.

.18 The registrant shall discuss, where applicable, risks associated with its discharge of wastewater.

- Relevant information to provide includes, but is not limited to:

  - Environmental constraints, such as the ability to maintain compliance with regulations focused on the quality of effluent discharged to the environment, the ability to eliminate existing and

emerging pollutants of concern, and the ability to maintain control over runoff and storm water discharges.

- External constraints, such as increased liability and/or reputational risks, restrictions to discharges and/or increased operating costs due to regulation, stakeholder perceptions and concerns related to water discharges (e.g., those from local communities, non-governmental organizations, and regulatory agencies), and the ability to obtain discharge rights or permits.

- How risks may vary by discharges to different sources, including wetlands, rivers, lakes, oceans, groundwater, rainwater, municipal water supplies, or other water utilities.

.19 The registrant should include a discussion of the potential impacts that these risks may have on its operations and the timeline over which such risks are expected to manifest.

- Impacts may include, but are not limited to, those associated with costs, revenues, liabilities, continuity of operations, and reputation.

.20 The registrant shall provide a description of its short-term and long-term strategy or plan to manage these risks, including the following, where relevant:

- Any water management targets it has set, and an analysis of performance against those targets.

  - Water management targets can include water management goals that the registrant prioritizes to manage its risks and opportunities associated with water withdrawal, consumption, or discharge.

  - Targets can include, but are not limited to, those associated with reducing water withdrawals, reducing water consumption, reducing water discharges, and improving the quality of wastewater discharges.

- The scope of its strategy, plans, or targets, such as whether they pertain differently to different business units, geographies, or water-consuming operational processes.

- The activities and investments required to achieve the plans and targets, and any risks or limiting factors that might affect achievement of the plans and/or targets.

- Disclosure corresponds to CDP Water Questionnaire W8.1, W8.1a, and W8.1b.

.21 For water management targets, the registrant shall additionally disclose:

- The percentage reduction or improvements from the base year, where:

  - The base year is the first year against which water management targets are evaluated toward the achievement of the target.

- Whether the target is absolute or intensity based, and the metric denominator if it is an intensity-based target.
- The timelines for the water management plans, including the start year, the target year, and the base year.
- The mechanism(s) for achieving the target, including:
  - Efficiency efforts, such as the use of water recycling and/or closed-loop systems
  - Product innovations such as redesigning products or services to require less water
  - Process and equipment innovations, such as those that enable the use of less water in manufacturing or operations
  - The use of tools and technologies (e.g., the World Wildlife Fund Water Risk Filter, WRI/WBCSD Global Water Tool, and Water Footprint Network Footprint Assessment Tool) to analyze water use, risk, and opportunities
  - Collaborations or programs in place with the community or other organizations

.22 Disclosure of strategies, plans, and targets shall be limited to activities that were ongoing (active) or reached completion during the fiscal year.

.23 The registrant shall discuss if its water management practices result in any additional lifecycle impacts or tradeoffs in its organization, including tradeoffs in land use, energy consumption, and greenhouse gas (GHG) emissions, and why the registrant chose these practices despite lifecycle tradeoffs.

Hazardous Materials Management

Description

Solar panel manufacturing involves the use of hazardous chemicals that can cause human health and environmental harm if they are not properly managed. Common thin-film technologies can utilize hazardous substances such as cadmium, gallium arsenide, and copper indium gallium diselenide, which require careful handling during the manufacturing process. The cleaning of the semiconductor surface in silicon PV manufacturing can involve the use of chemicals such as hydrochloric acid, sulfuric acid, and hydrogen fluoride. Hazardous materials management is an important factor in preserving the Solar Energy industry's reputation as an environmentally sustainable energy source. Hazardous waste handling and disposal generate ongoing pollution-abatement costs and capital expenditures. In addition, improper treatment or disposal of hazardous process materials could result in contamination of local water or land, potentially harming brand value or resulting in regulatory penalties. Effective management of hazardous materials, including through reduction, reuse, recycling, and safe storage and disposal, can lower operating costs and mitigate potential regulatory penalties or reputational damage.

Accounting Metrics

RR0102-04. Amount of hazardous waste, percentage recycled

.24 The amount of hazardous waste shall be calculated in metric tons, where:

- Hazardous waste includes both hazardous secondary materials, per 40 CFR 260.10, and waste that meets the definition of hazardous waste under Subtitle C of the U.S. EPA's Resource Conservation and Recovery Act (RCRA), per 40 CFR 261.3.
- Hazardous wastes include those that display the following characteristics: ignitability, corrosivity, reactivity, or toxicity.

.25 The percentage recycled shall be calculated as the weight of hazardous waste material that was reused or reclaimed, plus the weight recycled or remanufactured (through treatment or processing) by the registrant, plus the amount sent externally for further recycling, divided by the total weight of hazardous waste material, where:

- Reclaimed materials are defined as materials processed to recover or regenerate a usable product, consistent with RCRA hazardous waste regulation. Common hazardous waste reclamation activities involve recovery of spent solvents (e.g., recovery of acetone) or metals (e.g., recovery of lead).
- Reused materials are defined as those recovered products or components of products that are used for the same purpose for which they were conceived.
- Recycled and remanufactured materials are defined as waste materials that have been reprocessed or treated by means of production or manufacturing processes and made into a final product or a component for incorporation into a product.

- Materials sent for further recycling include those materials that are transferred to a third party for the express purpose of reuse, recycling, or refurbishment.

- The scope of recycled and remanufactured products includes primary recycled materials, co-products (outputs of equal value to primary recycled materials), and by-products (outputs of lesser value than primary recycled materials).

- Portions of products and materials that are disposed of in landfills are not considered recycled. Only the portions of products that are directly incorporated into new products, co-products, or by-products shall be included in the percentage recycled.

- Materials incinerated, including for energy recovery, are not considered reused or recycled. Energy recovery is defined as the use of combustible waste as a means to generate energy through direct incineration, with or without other waste, but with recovery of the heat.

.26 Electronic waste material (e-waste) shall be considered recycled only if the registrant can demonstrate that this material was transferred to entities with third-party certification to a standard for e-waste recycling, such as Basel Action Network's e-Steward® standard or the U.S. EPA's Responsible Recycling Practices (R2) standard.

- The registrant shall disclose the standard(s) with which the entities it has transferred e-waste to are compliant.

RR0102-05. Number and aggregate quantity of reportable spills, quantity recovered

.27 The registrant shall disclose the total number and quantity (in kilograms) of reportable spills, where:

- Reportable spills are defined as any release of a hazardous substance in an amount equal to or greater than the reportable quantity as listed in Table 302.4 in 40 CFR Part 302.4 of the U.S. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), including consideration of reportable quantities of mixtures and solutions as defined under 40 CFR Part 302.6 (b)(1).

- The number of reportable spills shall include any leaks, emissions, discharges, injections, disposals, and abandonment releases over time, counted once at the time identified, consistent with the CERCLA definition of release (42 USC 9601(22)) and guidelines for reporting requirements (40 CFR Part 302).

- The aggregate quantity reported shall represent the total quantity of material released to the environment and shall not be reduced by the amount of such hazardous substances that are subsequently recovered, evaporated, or otherwise lost.

- The scope of disclosure includes all spills, even those in jurisdictions that are not subject to regulation under CERCLA.

.28 The registrant shall calculate the quantity of spills recovered as the quantity of spilled hazardous substances (in kilograms) removed from the environment through short-term release response activities, excluding:

- Amounts that were recovered during longer-term remediation at spill sites.
- Amounts that evaporated, burned, or were dispersed.

.29 The registrant may choose to disclose releases to soil and water separately. A release that qualifies as a release to both soil and water should be reported as a single release to water, with the volume properly apportioned to soil and water.

.30 The registrant may choose to separately indicate spills that occurred in the past, such as those that resulted from abandoned, legacy, or decommissioned operations but that were identified and disclosed during the fiscal year.

Note to **RR0102-05**

.31 Where applicable, the registrant shall discuss its activities to remediate spills that occurred in years prior to the disclosure period but for which remediation activities are ongoing and long term.

.32 Relevant activities include, but are not limited to, land-use controls, site monitoring, site maintenance, and continued cleanup.

Additional References

For guidance on the "legitimate recycling" of hazardous waste, see 40 CFR 260.43.

Community & Ecological Impacts of Project Development

Description

Many large, publicly listed solar energy companies are involved in project development, including the evaluation and acquisition of land rights, site permitting, and engagement with stakeholders. Successful development is contingent on securing the approval of environmental permits and permission from local governments and communities. Siting of medium or large solar installations in ecologically sensitive areas, including endangered species habitats, can render environmental permitting more difficult and costly. Project development may also be affected by local land-use laws and community opposition to projects due to their environmental and community impacts, such as noise and threatened property values. CSP projects may face opposition because of their significant land footprint and concerns over impacts on local water resources. These factors can slow or disrupt the development process, possibly resulting in higher costs, lost revenues, or impaired project assets. Companies with robust strategies for environmental impact assessment and mitigation and community engagement can reduce the risk of project delays, increasing the likelihood of successful project completion.

Accounting Metrics

RR0102-06. Project development asset impairments associated with community or ecological impacts

.33 The registrant shall disclose the amount of project development asset write-offs, in U.S. dollars, that resulted from asset impairments during the fiscal year for reasons related to, or associated with, in whole or in part, community or ecological impacts of the project, where:

- Project development assets are defined by the registrant, consistent with its existing public disclosure of project development assets, regardless of terminology used by the registrant (e.g., "Project assets," "Project assets—plants and land," "Solar Energy Systems Held for Development and Sale," etc.). At a minimum, project development assets meet the following criteria:
    - Assets that are associated with solar energy systems that are under development or fully developed, owned by the registrant, and held for sale or intended to be sold to a third party prior to the execution of a definitive sales agreement; and
    - Assets that consist primarily of capitalized costs incurred in connection with the development of solar energy systems.
- Write-offs (or write-downs) that resulted from asset impairments are defined by the registrant, consistent with its existing public disclosure of write-offs and asset impairments.
- Project development asset impairments for reasons related to, or associated with, community and/or ecological impacts are defined as those impairments that can reasonably be determined to relate to the following:

- Community opposition to solar energy system project development or operations, including, but not limited to, opposition related to land use, purported property valuation impacts, visual aesthetics, and safety of human health or property; and

- Ecological impact or risks of ecological impact of solar energy system project development or operations, including, but not limited to, risks to wildlife or habitat loss.

- Project development asset impairments for reasons related to, or associated with, community and/or ecological impacts include impairments resulting from voluntary or involuntary actions taken relating, in whole or in part, to community and/or ecological impact, including the following:

  - Inability to obtain necessary permits, approvals, financing, or other requirements; and

  - Voluntary decisions to abandon, delay, alter, or scale back projects.

- If a project development asset impairment occurs for multiple reasons including one or more that is related to, or associated with, community and/or ecological impacts, the impairment shall be included in the scope of disclosure in its entirety.

.34 The scope of disclosure shall include all project development assets regardless of the level of development activity occurring and the stage of development of the associated solar energy system, including delayed projects, pre-construction development activities, construction, and systems in the operational stage.

.35 The registrant may choose to additionally disclose project asset impairments by solar energy system capacity.

.36 The registrant may choose to discuss specific project asset impairments, including root causes and corrective actions to reduce the risk of future project asset impairments due to community or ecological impacts.

RR0102-07. Description of efforts in solar energy system project development to address community and ecological impacts

.37 The registrant shall describe its efforts to address the community and ecological impacts of solar energy system project development and operation, where:

- Community impacts may include, but are not limited to, land use, concerns around property valuation impacts, visual aesthetics, safety of human health or property, and noise and congestion resulting from construction activities.

- Ecological impacts may include, but are not limited to, land use, risk of habitat disruption, water consumption, wildlife fatalities, and ecological impacts of construction.

.38 The scope of disclosure shall include all solar energy system projects under development, or under consideration for development, regardless of actual or intended ownership.

.39 The scope of disclosure shall include efforts, activities, and strategies related to project siting, project design, engagement of the community and other stakeholders, and engagement with regulatory authorities or other permitting authorities.

.40 The registrant shall describe its efforts to eliminate or mitigate community risks and address community concerns and/or efforts to communicate project benefits and expected impacts, including, but not limited to:

- The use of social impact assessments (SIA) that evaluate, manage, and mitigate risks.
- Efforts to engage with stakeholders, build consensus, and collaborate with communities.
- Efforts to create benefits for communities through projects.
- New and emerging technologies that the registrant expects to incorporate into projects that may improve impacts.

Management of Energy Infrastructure Integration & Related Regulations

Description

The Solar Energy industry continues to benefit from accommodative government renewable energy policies worldwide (e.g., the EPA's Clean Power Plan), fostered in large part by many countries desire to transition to a low-carbon energy economy. However, if the industry wants to ensure continued policy support and greater adoption of solar for greenhouse gas (GHG) mitigation and energy security, it must work to prevent systemic disruptions to the existing energy infrastructure and access to essential energy services.

Companies are innovating to overcome the technical challenges of increasing solar energy on the grid. They are also engaging with regulatory agencies and policymakers to reduce regulatory barriers to the adoption of solar energy, many of which are emerging due to the concern around increasing overall grid electricity costs and grid disruptions. Also, despite recent cost reductions, solar energy remains a relatively expensive means of energy production and GHG reduction, and as a result, it is still a small portion of global electricity generation. Solar companies are investing in innovations to reduce hardware and installation costs, and working toward business-model innovation to reduce the cost of capital and facilitate the purchase of solar energy systems. Solar energy companies must be able to deploy one or more of these strategies successfully to ensure business survival and business scale-up over the long term.

Accounting Metrics

RR0102-08. Average price of solar energy (1) photovoltaic (PV) modules and (2) completed utility-scale systems

.41 The registrant shall calculate and disclose its average sales price of (1) solar energy photovoltaic (PV) modules and (2) completed utility-scale solar energy systems during the fiscal year.

- Solar energy PV module sales shall be calculated as the total revenue from solar energy PV module sales, in U.S. dollars, divided by the total rated capacity of solar energy PV module sales, in watts ($/W).
    - Solar energy PV modules are defined in accordance with the U.S. DOE Solar Energy Glossary: photovoltaic (PV) module.[16]
    - The scope of solar energy module sales shall only include revenue from the PV module hardware and shall exclude revenue resulting from non-hardware sales and services, such as software, service agreements, etc.

[16] For additional reference, see IEC/TS 61836 Ed. 3.0, "Solar photovoltaic energy systems—Terms, definitions and symbols."

- The average sales price of completed utility-scale solar energy systems shall be calculated as the total revenue from completed utility-scale solar energy systems, in U.S. dollars, divided by the total rated capacity of completed utility-scale solar energy systems, in watts ($/W).
    - Solar energy systems are defined as any system that converts sunlight into electrical energy, in accordance with the U.S. DOE Solar Energy Glossary, including, but not limited to, "photovoltaic (PV) system" and "solar thermal electric systems."[17]
    - Utility-scale scale systems are defined in accordance with the Lawrence Berkeley National Laboratory as any ground-mounted solar project that is larger than 5 MW_{AC}.
    - Completed systems are defined by the registrant, consistent with its existing public disclosure of completed systems.
    - The scope of revenue from completed solar energy systems shall only include revenue directly from the solar energy systems and shall exclude revenue resulting from service agreements and other associated services.
- Rated capacity is defined as the maximum output (generation) of solar energy systems, in watts (W), also referred to as nameplate capacity, measured in accordance with an applicable standard, including, but not limited to, IEC 61215, IEC 61646, or IEC 62108.

.42 Where the registrant utilizes leases to customers, it shall use an appropriate methodology for calculating the implied sales price and shall disclose the methodology used.

.43 The scope of disclosure shall include (1) solar energy PV module sales and (2) completed solar energy systems that occurred during the fiscal year.

.44 The registrant shall not double-count any (1) solar energy PV module sale or (2) completed solar energy system in either (1) or (2) above.

.45 The scope of disclosure shall exclude intercompany transactions and completed solar energy systems retained by the registrant.

.46 The registrant may disclose prices by category of customer, where:

- Categories of customers may include utilities, independent power developers and producers, distributors, contractors and installers, commercial and industrial companies, and residential customers.

[17] Ibid.

RR0102-09. Description of risks associated with integration of solar energy into existing energy infrastructure and discussion of efforts to manage those risks

.47 The registrant shall describe risks, challenges, and barriers surrounding the integration of solar energy into the existing energy infrastructure in terms of its products and services.

- Relevant information to provide may include, but is not limited to:
  - Technological barriers to increased integration of solar energy, such as limited transmission network connectivity, lack of access to high-capacity transmission networks, variability in interconnection standards, and inverter interconnection requirements;
  - Operational barriers to increased integration of solar energy, such as curtailment and challenges associated with the variable nature of solar energy; and
  - Customer motivations for seeking increased integration of solar energy, such as economic advantages, regulatory compliance, risk mitigation, public perception or reputational risk, etc.

.48 The registrant shall discuss its strategy and approach to design, development, and sales in order to integrate solar energy into the existing energy infrastructure.

- Relevant strategies and approaches may include, but are not limited to:
  - Technical product design;
  - Development of new products or product components (e.g., smart inverters);
  - Technical innovation designed to reduce the cost of solar energy modules and/or systems;
  - Third-party partnerships and product integrations;
  - Project design (e.g., project siting in regions with reduced curtailment risk);
  - Project risk transfer (e.g., power purchase agreements (PPAs) with curtailment caps);
  - Marketing and sales (e.g., focus on regions or customer segments with less grid integration risk);
  - The incorporation of energy storage technology, or "smart grid" technology, into solar energy systems, whether through proprietary technological development or collaboration with third parties;
  - Products designed to operate "off-grid" or as part of "micro-grids;"
  - Innovation designed to decrease solar energy's levelized cost of energy (LCOE) through the reduction in "soft costs," including financing, leasing, customer acquisition, and development costs; and
  - Innovation designed to increase the total addressable solar energy market.

- Relevant information to provide includes, but is not limited to:
    - Whether the registrant pursues multiple approaches;
    - Whether the registrant's approach differs by market;
    - The intensity of R&D requirements for the registrant's approach and strategy;
    - The level of competition relative to the registrant's approach and strategy; and
    - How the registrant evaluates the success of its approach.

.49 The scope of disclosure shall include all of the registrant's solar energy-related products, product components, projects, project development efforts, and services, as well as the associated marketing and sales strategies, in the markets in which the registrant operates.

.50 The registrant should describe how energy infrastructure influences the establishment of sales targets, strategies for specific product categories, technologies or marketing practices in specific regions, research and development (R&D) objectives, partnerships, etc.

RR0102-10. Discussion of risks and opportunities associated with energy policy and its impact on the integration of solar energy into existing energy infrastructure

.51 The registrant shall discuss its risks and opportunities associated with energy policy and the impact energy policy has on the integration of solar energy into existing energy infrastructure, where:

- Relevant risks and opportunities may include, but are not limited to:
    - Direct or indirect government subsidization of solar energy;
    - International trade policy disputes and agreements;
    - Public policies that establish minimum requirements for renewable energy generation (e.g., renewable portfolio standards);
    - Public policies that affect the monetization of solar energy generation, including, but not limited to, net metering, time-of-use rates, feed-in tariffs, utility fixed fees, and renewable energy priority dispatch;
    - Public policies that affect the financing and tax structure of solar energy, including, but not limited to, investment tax credits, property-assessed clean energy, loan guarantees, and depreciation schedules;
    - Public policies pertaining to any external social costs created by distributed solar energy generation;

- Policies pertaining to electricity transmission, including, but not limited to, regional transmission planning, interconnected transmission networks, interconnection standards, and high-capacity transmission networks; and

- Replacements to ageing energy-generation and transmission infrastructure.

.52 The registrant shall identify risks and opportunities it faces related to legislation, regulation, rule-making, actions of individual politicians, and the overall political environment (hereafter referred to collectively as "regulatory and political environment") related to energy policy and the integration of solar energy into energy infrastructure.

- The scope shall include existing, emerging, and known future risks and opportunities.

- The scope shall include risks and opportunities that may exist within the U.S. at the local, state, and federal levels as well as foreign governments, international governmental organizations, and regulatory organizations.

    - The scope shall include the relevant policies of utilities, rule-makers, and regulators or their delegates.

.53 Relevant information to provide includes, but is not limited to, the impact on demand for the registrant's solar energy products and services and the impact on business viability related to risks and opportunities associated with energy policy and the impact energy policy has on the integration of solar energy into the existing energy infrastructure.

.54 The registrant shall provide a description of its short-term and long-term strategy or plan to manage these risks and opportunities, including the following, where relevant:

- Efforts to influence the regulatory and political environment, including, but not limited to:

    - Direct lobbying, as defined by the Internal Revenue Service (IRS) as "the attempt to influence a legislative body through communication with a member or employee of a legislative body, or with a government official who participates in formulating legislation."

    - Grassroots lobbying, as defined by the IRS as "the attempt to influence legislation by attempting to affect the opinion of the public with respect to the legislation and encouraging the audience to take action with respect to the legislation."

    - Direct or indirect contributions or expenditures in support of, or opposition to, a candidate for public office or a ballot measure.

    - Any payments made to trade associations or tax-exempt entities that may be used (where permitted) for lobbying, campaign contributions, or in ways that otherwise exert influence on a political campaign or ballot measure.

- Other interactions with regulatory agencies, rule-makers, or their delegates, including public utilities commissions, the Federal Energy Regulatory Commission (FERC), regional transmission organizations, and independent system operators.

- Any direct or indirect political expenditure (one-time or recurring) that must be reported to the Federal Election Commission (FEC), the IRS, or a state disclosure agency.

Product Lifecycle Environmental Impacts

Description

Solar panels contain hazardous substances as well as reusable materials of high economic value. Materials recovery and recycling are important in lowering the environmental impacts from the extraction of virgin materials and from waste streams. Given the rapid expansion of solar energy in recent years, increasing volumes of solar panels are expected to reach the end of their useful life in the medium term. In some regions, manufacturers are required by law to take financial responsibility for their products at the end-of-life stage, including collection and recycling. Any revenue contraction from additional end-user costs for hazardous waste disposal could have a significant effect on profits. The issue could also cause the industry reputational damage in the medium to long-term. Management of these risks could improving the recyclability of panels and components. Furthermore, as more modules reach the end of their life and this issue likely receives more legislative attention, being able to offer take-back and recycling services in a cost-effective manner could become an important differentiator between companies. This could increase the revenue of companies that have a robust system in place to handle end-of-life recycling. Companies could also benefit from lower costs by reusing recovered materials in their manufacturing processes.

Accounting Metrics

RR0102-11. Percentage of products sold that are recyclable or reusable

.55 The registrant shall disclose the percentage of products, by weight (in metric tons), that are reusable or recyclable, where:

- "Reusable" is defined as a product or packaging that has been conceived and designed to accomplish, within its lifecycle, a certain number of trips, rotations, or uses for the same purpose for which it was conceived, consistent with definitions in ISO 14021:1999, *Environmental labels and declarations—Self-declared environmental claims (Type II environmental labelling)*.

- "Recyclable" is defined a product or packaging that can be diverted from the waste stream through available processes and programs and can be collected, processed, and returned to use in the form of raw materials or products, consistent with definitions in ISO 14021:1999, *Environmental labels and declarations—Self-declared environmental claims (Type II environmental labelling)*.

.56 For products or product materials that are partially made of recyclable or reusable materials, the registrant shall classify the portion of the material that is recyclable or reusable based on a calculation (or estimate, where appropriate) of the weight of each portion.

.57 A product or its components shall be considered recyclable or reusable if this claim is aligned with 16 CFR Part 260, Guides for the Use of Environmental Marketing Claims; Final Rule, (also known as the "FTC Green Guides"), including the following elements:

- A product or package shall not be marketed as recyclable unless it can be collected, separated, or otherwise recovered from the waste stream through an established recycling program for reuse or use in manufacturing or assembling another item.

- When recycling facilities are available to a substantial majority (i.e., 60 percent) of consumers or communities where the item is sold, the registrant may consider the product (or product component) recyclable without a qualification.

- When recycling facilities are available to less than a substantial majority of customers or communities where the product is sold, the registrant shall only consider the product (or product components) recyclable if it makes the appropriate qualification to its customers.

- For items that are partially made of recyclable components, the registrant shall only consider those components recyclable if (a) it clearly and prominently qualifies the recyclable claim to avoid deception about which portions are recyclable, and (b) no components significantly limit the ability to disassemble and recycle the product or components of the product (e.g., the size, shape, or assembly method).

RR0102-12. Weight of end-of-life material recovered, percentage of recovered materials that are recycled

.58 The registrant shall disclose the weight, in metric tons, of materials recovered, including those recovered through recycling services, product take-back programs, and refurbishment services, where:

- The scope of disclosure shall include products, materials, and parts at the end of their useful life that would have otherwise been disposed of as waste or used for energy recovery, but have instead been collected.

- The scope of disclosure shall include both materials physically handled by the registrant and materials of which the registrant does not take physical possession, but for which it has contracted with a third party the task of collection for the express purpose of reuse, recycling, or refurbishment.

- The scope of disclosure excludes products and parts that are in warranty and have been collected for repairs.

.59 The percentage recycled shall be calculated as the weight of incoming material that was reused or reclaimed, plus the weight of material recycled or remanufactured (through treatment or processing) by the registrant, plus the weight of material sent externally for further recycling, divided by the total weight of incoming recovered material, where:

- A material is recycled if it is used, reused, or reclaimed.

- Reclaimed materials are defined as those processed to recover or regenerate a usable product.

- Reused materials are defined as those recovered products or components of products that are used for the same purpose for which they were conceived.

- Recycled and remanufactured materials are defined as waste materials that have been reprocessed or treated by means of production or manufacturing processes and made into a final product or a component for incorporation into a product.

- Materials sent for further recycling include those materials that are transferred to a third party for the express purpose of reuse, recycling, or refurbishment.

- The scope of recycled and remanufactured products includes primary recycled materials, co-products (outputs of equal value to primary recycled materials), and by-products (outputs of lesser value than primary recycled materials).

- Portions of products and materials that are disposed of in landfills are not considered recycled. Only the portions of products that are directly incorporated into new products, co-products, or by-products shall be included in the percentage recycled.

- Materials incinerated, including for energy recovery, are not considered reused, recycled, or reclaimed. Energy recovery is defined as the use of combustible waste as a means to generate energy through direct incineration, with or without other waste, but with recovery of the heat.

.60 Electronic waste material (e-waste) shall be considered recycled only if the registrant can demonstrate that the material was transferred to entities with third-party certification to a standard for e-waste recycling such as Basel Action Network's e-Steward® standard or the U.S. EPA's Responsible Recycling Practices (R2) standard.

- The registrant shall disclose the standard(s) to which the entities it has transferred e-waste to are compliant.

RR0102-13. Discussion of approach to manage use, reclamation, and disposal of hazardous materials

.61 The registrant shall discuss its strategies to manage the use of hazardous materials, where:

- Hazardous materials include both hazardous secondary materials, per 40 CFR 260.10, and waste that meets the definition of hazardous waste under Subtitle C of the U.S. EPA's RCRA, per 40 CFR 261.3.

- Hazardous materials include those that display the following characteristics: ignitability, corrosivity, reactivity, or toxicity.

.62 The registrant shall discuss its approach to design for reducing use of hazardous materials or substituting them with non-hazardous materials and its strategies to mitigate risks associated with the use of hazardous materials.

.63 The registrant should identify which hazardous materials are used in its products.

.64 The registrant shall discuss its approach to design and strategies to increase the disposal or reclamation of hazardous materials in the product end-of-life stage, including take-back programs and direct contracts with third-party hazardous waste reclamation services.

.65 The registrant shall describe the root cause and its corrective actions for any incidences when its use, reclamation, and/or disposal of hazardous materials deviated from its expected outcomes, such as those resulting in a release to the environment (i.e., those disclosed in RR0102-05), regulatory non-compliance, and/or human health and safety impacts.

Materials Sourcing

Description

Solar panel materials such as tin and polysilicon can have negative environmental and social impacts in the supply chain. The process of purifying polysilicon, the main input in a majority of solar panels, creates a harmful wastewater by-product called silicon tetrachloride. Equipment to recycle this wastewater to extract silicon is available but expensive, and not all polysilicon refiners utilize it. The improper disposal of such waste in the supply chain has been associated with killing fish and wildlife, destroying farmland, and causing higher cancer rates in affected areas. These supply-chain impacts could affect the reputation of listed solar energy companies, potentially hurting their revenue-growth prospects. In addition, suppliers may be required to curtail production if they violate environmental regulations, which could, in turn, disrupt production at solar manufacturing plants. U.S. solar companies are required to comply with federal regulations and face other pressures to track and eliminate the use of minerals responsible for conflict in the Democratic Republic of the Congo. Some solar panels contain all four of the "conflict" minerals (tin, tantalum, tungsten, and gold), although many contain only tin. In addition to facing reputational and regulatory risks from sourcing tin from conflict-torn areas, solar energy companies face competition from increasing global demand for tin from other sectors. Along with supply constraints, this can result in significant price increases and supply chain risks. Companies can minimize negative externalities of sourcing sensitive materials like polysilicon and conflict minerals and protect themselves from related risks by having transparent supply chains, working actively to source materials from reliable suppliers or regions that have minimal environmental or social risks, and supporting research for alternative inputs.

Accounting Metrics

RR0102-14. Percentage of tungsten, tin, tantalum, and gold smelters within the supply chain that are verified conflict-free

.66 The registrant shall calculate the percentage as the number of tungsten, tin, tantalum, and gold smelters and/or refineries within its supply chain that are verified to be conflict-free divided by the total number of tungsten, tin, tantalum, and gold smelters and/or refineries within its supply chain.

.67 A smelter or refiner is considered to be conflict-free if it can demonstrate compliance with:

- The Electronic Industry Citizenship Coalition (EICC) and Global e-Sustainability Initiatives (GeSI) Conflict-Free Smelter Program (CFSP) assessment protocols.
- The Responsible Jewellery Council's (RJC) Chain-of-Custody (CoC) Standard.

.68 A smelter or refinery is considered to be within the registrant's supply chain if it supplies, or is approved to supply, tungsten, tin, tantalum, or gold that is contained in any product the registrant manufactures or contracts to be manufactured.

- The scope includes smelters or refineries that supply material directly to the registrant as well as those that supply material to any of its suppliers of raw materials, components, or subassemblies.

RR0102-15. Discussion of the management of risks associated with the use of conflict minerals

.69 The registrant shall discuss its strategic approach to managing its risks associated with the use of conflict minerals in its products, including physical limits on availability and access, price, and reputational risks, where:

- Conflict minerals are defined as tungsten, tin, tantalum, and gold.

.70 The registrant should identify which minerals present a risk to its operations, which type of risk they represent, and the strategies the registrant uses to mitigate the risk.

.71 Relevant strategies to discuss include due diligence practices, supply chain auditing, supply chain engagement, and partnerships with industry groups or nongovernmental development organizations.

RR0102-16. Discussion of the management of environmental risks associated with the polysilicon supply chain

.72 The registrant shall discuss its approach to managing the environmental risks associated with the polysilicon supply chain, including, but not limited to, risks of suppliers' noncompliance with environmental regulations and risks associated with suppliers' disposal and handling of manufacturing wastes (including tetrachloride).

.73 Relevant strategies to discuss include due diligence practices, supply chain auditing, supply chain engagement, codes of conduct, and partnerships with industry groups or nongovernmental development organizations.

.74 The registrant shall describe its process for implementing corrective actions in the event of noncompliance with environmental regulations in the supply chain, including the use of alternative suppliers.

.75 The registrant should identify which materials within the polysilicon supply chain present an environmental risk to its operations, which type of risk they represent (e.g., regulatory compliance, reputational risk, or physical limits on availability and access), and the strategies the registrant uses to mitigate the risk.

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