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Standard Terminology Relating to Photovoltaic Solar Energy Conversion¹

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1. Scope

1.1 This terminology pertains to photovoltaic (radiant-to-electrical energy conversion) device performance measurements and is not a comprehensive list of terminology for photovoltaics in general.

1.2 Additional terms used in this terminology and of interest to solar energy may be found in Terminology E 772.

2. Referenced Documents

2.1 *ASTM Standards:*

E 490 Solar Constant and Air Mass Zero Solar Spectral Irradiance Tables²

¹ This terminology is under the jurisdiction of ASTM Committee E44 on Solar, Geothermal, and Other Alternative Energy Sources and is the direct responsibility of Subcommittee E44.09 on Photovoltaic Electric Power Conversion.

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E 772 Terminology Relating to Solar Energy Conversion³

EG 89159 Tables for Terrestrial Direct Normal Referencel Solar Spectral Irradiance for Air Mass 1.5³

E 892 Tables for Terrestrial Solar Spectral Irradiance at Air Mass 1.5: Direct Normal and Hemispherical for a 37° Tilted Surface⁴

3. Terminology

3.1 Definitions:

absolute spectral response, n — $R_a(\lambda)$, AW^{-1} , n —of a photovoltaic device, the short-circuit current density per unit irradiance at a given wavelength.

DISCUSSION—Spectral response is normally reported over the wavelength range to which a device responds.

cell temperature, n —the temperature of the semiconductor junction of a photovoltaic cell.

efficiency, n —of a photovoltaic device, the ratio of the power produced by a photovoltaic device operated at its maximum power point to the incident radiant power.

fill factor, n —of a photovoltaic device, the ratio of maximum power to the product of open-circuit voltage and short-circuit current.

global horizontal solar irradiance, n —See **global solar irradiance** in Terminology E 772.

global normal solar irradiance, n —solar irradiance from a 2π steradian field-of-view incident upon a surface that is perpendicular to the axis of the solid angle defined by the disk of the sun.

irradiance, E , Wm^{-2} , n —See **solar irradiance at a point of surface** in Terminology E 772.

maximum power, n —of a photovoltaic device, the electrical output when operated at a point where the product of current and voltage is maximum.

open-circuit voltage, n —of a photovoltaic device, the voltage potential across the positive and the negative terminals under irradiation when zero current flows into or out of these terminals.

photovoltaic array, n —an assembly of panels or modules, together with support structure and other components (if used), to form a complete dc power-producing unit.

photovoltaic cell, n —the basic device that generates electricity by the photovoltaic effect when exposed to radiant energy such as sunlight.

photovoltaic cell area, n —the total frontal area of the cell including the area covered by the grids and contacts.

photovoltaic device, n —any photovoltaic cell or collection of cells (module, panel, or array) under consideration.

photovoltaic module, n —a single package containing two or more electrically interconnected photovoltaic cells, including a frame or integral mounting points, and means for electrical connection; which make it suitable for field installation without additional modification.

photovoltaic module area, n —the rectangular area that touches the extreme outside edges of the module.

photovoltaic panel, n —a number of modules which are electrically connected and mechanically integrated, and designed to provide a field-installable unit.

photovoltaic reference cell, n —a photovoltaic cell whose short-circuit current is calibrated against the total irradiance of a reference spectral irradiance distribution. See also **reference cell calibration constant**.

primary photovoltaic reference cell, n —a photovoltaic reference cell calibrated in sunlight.

rated power, n — See **reported power**.

reference cell calibration constant, n —a number that expresses the calibration of a photovoltaic reference cell in terms of short-circuit current per unit incident irradiance at a given temperature.

DISCUSSION—For a calibrated reference cell, the calibration constant equals the short-circuit current of the photovoltaic reference cell when irradiated by a reference spectral irradiance distribution (such as Standard E 490 or Tables ~~E 891 or E 892~~ G 159) divided by the total irradiance of that reference spectral irradiance distribution.

reported power, n —of a photovoltaic device, the output power at a selected test voltage.

relative spectral response, $R_r(\lambda)$, n —of a photovoltaic device, the absolute spectral response of a photovoltaic device where the irradiance is measured in relative units.

DISCUSSION—The relative spectral response is used where the absolute magnitude of the spectral response is unimportant, simplifying the measurement procedure.

secondary photovoltaic reference cell, n —a photovoltaic reference cell calibrated against a primary reference cell.

short-circuit current, n —of a photovoltaic device, the current flowing between the positive and negative terminals under illumination when zero voltage appears across these terminals.

² Annual Book of ASTM Standards, Vol 15.03.

³ Annual Book of ASTM Standards, Vol 12.02.

⁴ Annual Book of ASTM Standards, Vol 14.04.

spectral irradiance, $E(\lambda)$, n —See **solar irradiance at a point of surface and spectral** in Terminology E 772.

spectral response, $R(\lambda)$, AW^{-1} , n —See **absolute spectral response**.

standard reporting conditions, n —for *photovoltaic performance measurements*, a fixed set of conditions that constitute the device temperature, the total irradiance, and the reference spectral irradiance distribution to which electrical performance data are translated.

total irradiance, n —(1) the integral of the solar spectral irradiance; (2) the solar irradiance measured by a wide bandwidth radiometer.

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