IEC TS 62994

Edition 1.0 2019-01

TECHNICAL SPECIFICATION

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Photovoltaic (PV) modules through the life cycle – Environmental health and safety (EH&S) risk assessment – General principles and nomenclature



IEC TS 62994:2019-01(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.160

ISBN 978-2-8322-6419-5

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PHOTOVOLTAIC (PV) MODULES THROUGH THE LIFE CYCLE – ENVIRONMENTAL HEALTH AND SAFETY (EH&S) RISK ASSESSMENT –

General principles and nomenclature

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62994, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
82/1370/DTS	82/1504/RVDTS

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- replaced by a revised edition, or
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INTRODUCTION

This Technical Specification establishes definitions of terms of environmental health and safety (EH&S) risk assessment and also basic principles and general methods for the EH&S risk assessment for the PV module through its life cycle.

EH&S risk assessment is a method to characterize and evaluate potential adverse impacts to human health or environment in order to develop policies to control and reduce them. Although PV technologies have environmental advantages over conventional energy technologies, PV modules can contain some hazardous materials. Therefore, EH&S risk assessment of PV modules is very important for the safe and sustainable manufacture, use, and end-of-life treatment of PV modules.

Though there are many standards relating to EH&S and risk assessment, there is no published IEC standard for the EH&S risk assessment of the PV module at present.

This technical specification was developed in cooperation with IEA PVPS task 12 (PV Environmental, Health and Safety Activities). The objectives of the task are to ‘quantify the environmental profile of PV in comparison to other energy technologies’ and ‘to define and address EH&S and sustainability issues that are important for PV market growth’. IEA PVPS task 12 and IEC TS 62994 Project team had joint meetings and established a liaison officer to work on this technical specification on the EH&S for the PV.

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General principles and nomenclature

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1 Scope

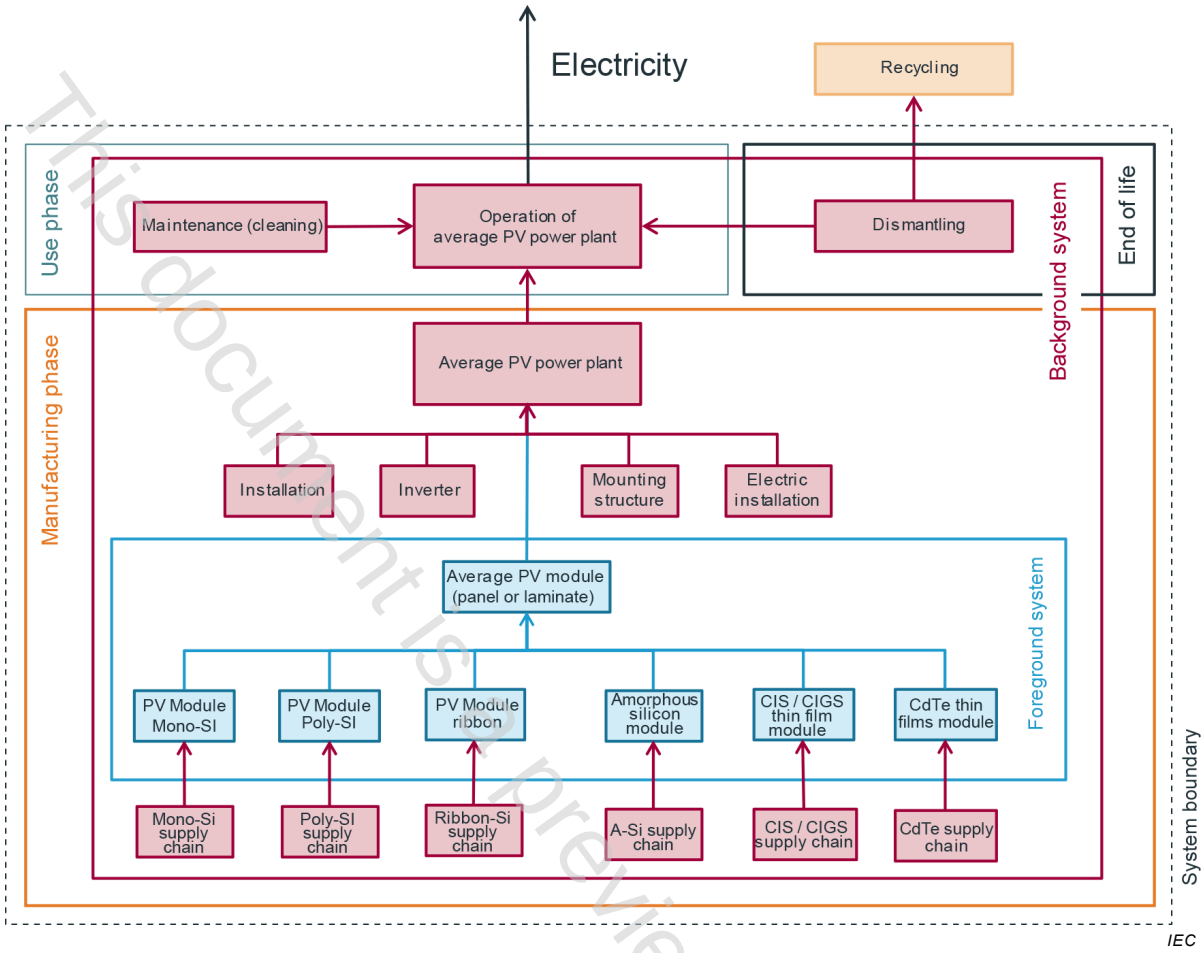
This document specifies definitions of terms and introduces evaluation methods for EH&S risk assessment for the PV module over the product life cycle. Environmental health and safety (EH&S) risk assessment is a method to characterize and evaluate potential adverse impacts to human health or environment and make it possible to take measures to reduce them. EH&S risk assessment of PV modules is very important for the safe and sustainable manufacture, use, and end of life treatment of PV modules. The definition of terms can be applied to the EH&S risk assessment through the life cycle of PV modules. Generally, evaluation methods for the EH&S risk assessment can be divided in two cases:

- ordinary foreseen routine operation, in which life cycle assessment method is applied;
- abnormal non-routine operation, in which risk assessment method is applied.

The scope of the two general cases is described below.

When assessing the environmental impacts of routine operation of PV electricity production with life cycle assessment, the product system includes the manufacturing phase, the use phase and the end of life phase (see Figure 1). Electronic installation, mounting structure and power conversion equipment (such as inverters) are included as part of the PV system to be analysed.

When assessing the risk of non-routine operation of PV modules, the system analysed is limited to the PV module, its supply chain, operation and end of life treatment, and its direct electrical and mechanical interfaces with the balance of system, i.e. the electric installation, mounting structure and inverters.



Processes of the foreground and background system are marked with blue and red colour, respectively (lighter coloured line and darker coloured line respectively for monochrome printed version).

Figure 1 – Product system of electricity produced with photovoltaic modules

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61724-1, *Photovoltaic system performance – Part 1: Monitoring*

IEC TS 61836, *Solar photovoltaic energy systems – Terms, definitions and symbols*

ISO/IEC Guide 51, *Safety aspect – Guidelines for their inclusion in standards*

ISO 14001, *Environmental management system – Requirements with guidance for use*

ISO 14004:2016, *Environmental management systems- General guidelines on implementation*

ISO 14040, *Environmental management -Life cycle assessment – Principles and framework*

ISO 14044:2006, *Environmental management – Life cycle assessment – Requirements and guidelines*

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OHSAS 18001: 2009, *Guide to implementing a Health & Safety Management System*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14001, OHSAS 18001, IEC TS 61836 and ISO/IEC Guide 51 as well as the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
Life Cycle Assessment
LCA
compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle

[SOURCE: ISO 14044:2006,3.2]

3.2
Life Cycle Impact Assessment
LCIA
phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product

[SOURCE: ISO 14044:2006, 3.4]

3.3
Energy Pay Back Time
EPBT
period required for an energy system to generate the same amount of energy (in terms of primary energy equivalent) that was used to produce the system itself

[SOURCE: Frischknecht R., Heath G., Raugei M., Sinha P. and de Wild-Scholten M.,2015, Methodology Guidelines on Life Cycle Assessment of Photovoltaic Electricity, 3rd edition. International Energy Agency, IEA, Paris]

3.4
environmental impact mitigation potentials
quantity of environmental mitigation achievable relative to a baseline or reference case. Mitigation means the elimination or reduction of frequency, magnitude or severity of exposure to risks, or minimization of a threat.

3.5
harm
physical injury or damage to persons and livestock

[SOURCE: IEC Guide 116:2010, 3.2, IEC 60050-903:2013, 903-01-01]

3.6
hazard
potential source of harm

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