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FIREBLOCK / RESEARCH STUDY

Fire causes in photovoltaic systems

A combined analysis of incident records
and research evidence

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PV Fire Intelligence

Incident and research evidence base

BRIDGEHILL RESEARCH STUDY | 2026

Published component comparisons and incident evidence. The chart on page 2 is a labelled published synthesis, not an independently pooled worldwide distribution.

Incident snapshot: 14 October 2026. Assessment baseline: 15 October 2026. Technical-context revision: 20 October 2026.
Source populations and quantitative results are unchanged; no pooled worldwide component distribution is claimed.

KEY FINDINGS

Executive summary

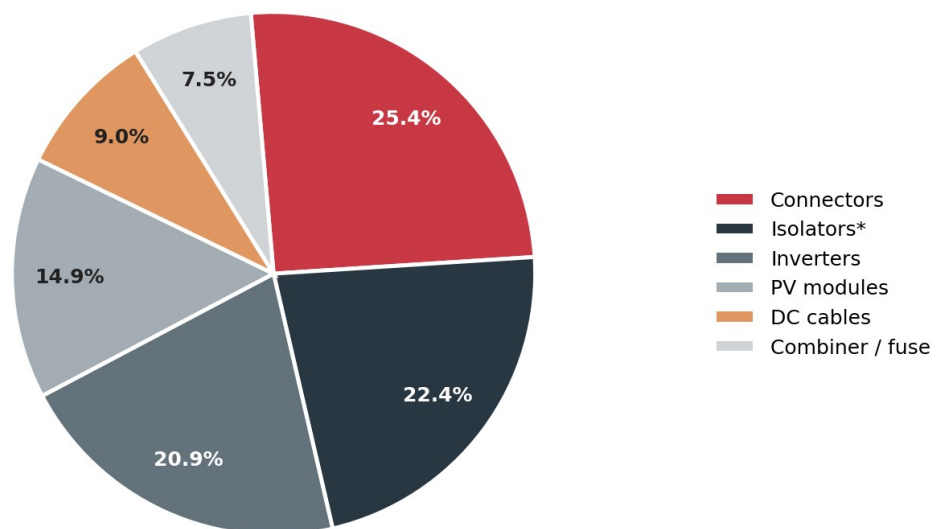
This study examines **where fires start in photovoltaic (PV) systems**, how the initiating faults develop and how consistently those causes are documented. It draws on the PV Fire Intelligence incident register and on published investigation, research and fire-service material. [P1] [D1]

Main component finding: connectors and DC cables account for 30% of the IFS investigation series (combined), approximately 25% of the Swedish series (combined), and 23.1% in the QBE PV-involvement series (combined). DC isolators dominate some Australian datasets. These are source-specific findings, not one pooled international percentage. [1] [2] [5] [6]

SOURCE-BASED COMPONENT PROFILE - NOT A POOLED WORLDWIDE RESULT

The chart is derived from published synthesis weights, with the unidentified/unrelated group excluded. It does not quantify specific mechanisms such as cross-mating or moisture ingress.

Figure 1. Component profile derived from the Ong et al. published synthesis



Bridgehill calculation from the rounded weights in Ong et al., Table 4 [8]: connectors 17%, cables 6%, isolators 15%, inverters 14%, modules 10%, combiner/fuse 5% and unidentified/unrelated 33%. Excluding the last group leaves 67%; each retained weight is divided by 67%. Thus $17/67 = 25.4\%$ and $15/67 = 22.4\%$. These are rescaled secondary-synthesis weights, not observed shares of all portal fires. *Isolators includes DC and AC equipment in the source grouping. Totals may differ from 100% through rounding.

Key point: connection defects, cable faults, switching equipment, inverters and PV modules are different potential initiation locations. The evidence shows that component ranking changes substantially by source. Prevention should therefore address both wiring/termination quality and switching equipment, while roof fire protection addresses subsequent spread. [1] [3] [5] [9]

01 / MAIN FINDINGS

What the component groups mean

A useful cause distribution answers one consistent question: **which component was reported to initiate the fire?** The analysis retains the source wording and its confidence level before mapping it to a broader group. A known assembly-level origin can be usable even when its internal failure mechanism is unresolved. [D1]

Table 1. Component categories used in this study

Component group	Plain-language meaning	Important boundary
DC cables	PV DC conductors, cable insulation and wiring paths.	Do not classify a failed terminal or plug connector as a cable-body fault.
Connectors and electrical connections	PV plug connectors, cable joints, terminations and other electrical contact points.	Terminal and connector causes only where supported; not proof of an MC4 product.
DC isolators	Equipment that disconnects the direct-current circuit.	Internal switch contacts are not PV plug connectors. Unspecified AC/DC stays unspecified.
Inverters	Units that convert DC power to AC power.	A fire in an inverter room does not, by itself, establish inverter ignition.
PV modules	The generating module assembly and its internal parts where so attributed.	Burned panels can be a consequence rather than the initiating component.
Junction boxes and distribution equipment	String-combining, protective and distribution assemblies.	A specifically identified cable or terminal failure is retained at that more precise level.
Other identified components	Other adequately identified initiating equipment.	Unknown or competing explanations are not placed in this group.

Figure 1 retains Ong et al.'s source groupings; Table 1 defines the more precise categories used when reviewing individual cases. The chart's connector group includes electrical terminations and is not an MC4-only category. Its isolator group includes AC and DC equipment; the inverter group also includes transformer and AC-distribution entries from some contributing sources. [8]

Component, mechanism and root cause are different

A cable or connector is a component; resistive heating or arcing is a mechanism; poor termination, cross-mating, moisture or animal damage can explain why it failed. These descriptions may apply to the same incident and must not be counted as separate fires. Neither the 25.4% connector share nor the 22.4% isolator share quantifies any one of those mechanisms. [8] [9] [10]

THE RULE FOR UNCERTAIN EVENTS

An unknown or ambiguous initiating component remains unallocated. Its exclusion from a classified-component chart must be visible in the accompanying coverage figures.

02 / EVIDENCE BASE

Breadth, depth and case accounting

The frozen portal frame contains **885 public incident records and 279 Research catalogue entries**, spanning 71 country/territory codes and 32 recorded source languages. The incident records link to 867 source records and 849 distinct registered URL strings. These describe the reach of the collection, not 849 completed investigations or 279 independent cause datasets. [D1]

Table 2. Scope of the registered evidence and assessment

Evidence layer	Audit figure	What it means
Frozen public incident frame	885 records	Every record is retained in the first-stage inventory.
Documented case-linked assessment	412 / 46.6%	Source, appendix or notice assessment at recorded depth; not 412 resolved causes.
Assessment or source access pending	473 / 53.4%	Not silently reclassified as unknown merely because review remains incomplete.
Seven quantified report series	895 entries	A selected gross subtotal; definitions and potential overlaps differ.
Portal frame + seven series	1,780 gross entries	Arithmetic sum only. Not a count of independent PV-origin fires.
Known overlapping block	80 BRE entries	Already represented in the portal; not additional observations.
Reconciled unique total / classified set	Not established	Both remain subject to completed source and overlap reconciliation.

The 895-entry subtotal comprises IFS 244, Sweden 155, BRE 80, Denmark 66, Queensland 100, Western Australia 38 and QBE 212. It is not an exhaustive sum of all literature considered. Secondary syntheses and other incompletely reconciled datasets are not added as independent fire observations. [1]-[7] [D1]

Depth is documented as well as reach

The audit distinguishes full or selected report passages, incident appendices, short official notices, indexed summaries and abstracts. Work already recorded includes competing component descriptions in BRE, the denominator used in Ong, the interpretation of TNO expert estimates, and overlapping publication families. An abstract review is not labelled a full-text investigation. [D1]

03 / METHODS

One event, one supported allocation

This retrospective descriptive study draws on published research series and the PV Fire Intelligence case ledger. Their populations, identity matching, and classifications are not automatically equivalent; study-specific results are therefore reported separately where pooled analysis would not be justified. [D1]

Eligibility for the principal component distribution

The intended principal analysis includes an actual fire with supported confirmed or probable PV origin and one sufficiently identified initiating component. A small fire with documented combustion may qualify; overheating or smoke alone is not automatically treated as fire. A report may identify the initiating assembly without establishing its internal failure mechanism.

Battery-origin events, externally initiated fires and stored or uninstalled equipment remain in the evidence record but outside the stated PV-origin fire denominator. Possible origin, competing component hypotheses and unsupported equipment labels remain separate. Missing building-type information is not, on its own, a reason to exclude usable cause evidence.

Resolving duplicate observations

Case identity is checked using dates, locations, original incident identifiers and source descriptions. A portal case and a report entry describing the same fire become one observation with several sources. A recurring fire at the same site can be a separate event when the date and sequence establish that distinction. Source families with unresolved aggregate overlap are compared separately rather than added as unique fires.

Calculating the percentages

CLASSIFIED COMPONENT SHARE

Eligible fires assigned to a component group / all eligible fires with a single supported component allocation. Counts support the calculation; percentages lead the presentation.

Compatible report category totals can contribute without invented individual cases. Rounded published percentages are not converted into exact event counts. A missing category is not zero. A simple average of incompatible study percentages is not the valid pooled estimator.

Uncertainty and reproducibility

The analytical record retains source wording, access level, locator, classification decision and cause confidence. Unclassified events are identified separately rather than allocated by assumption. Source heterogeneity limits the ability to derive a single pooled percentage from the available record.

The v0.23 register documents the incident assessments and source decisions. Technical references added on 20 October 2026 support interpretation and verification practice; they do not add incidents to the frozen frame or change the published component weights. [D1]

04 / RESEARCH COMPARISON

What the published series report

The source-specific results below are the main quantitative findings currently supported by the study. Their percentages use different populations and categories; they are not interchangeable estimates of one global distribution.

Table 3. Selected component findings, with the original denominator retained

Source family	Percentage finding	Interpretation
IFS, Germany [1]	30% connectors and cables; 25% roof-side; 18% storage; 13% inverter; 14% unknown.	Insurance investigations. Roof-side includes unresolved precise origin, not only module defects.
Sweden, 2018-2024 [2]	About 25% DC connectors and cables, the largest group.	Fires and incipient events. Approximate reading of an unlabelled bar chart; not exact raw counts.
BRE, UK [3]	DC isolators rank first; DC connectors follow.	Likely and additional possible assessments are separate. No verified exclusive percentage partition is imposed.
Denmark, 2020-H1 2025 [4]	25.8% inverter; 18.2% panel; 16.7% storage; 13.6% wiring/joints; 25.8% unreported/other.	Presumed PV origin; batteries included. Rounding affects the displayed sum.
Queensland, 2014-2018 [5]	54% DC isolator; 16% panel; 13% unknown; 8% inverter; 5% switchboard; 4% battery.	Indicative PV-involvement series. No separate connector category; panel coding may hide another component.
Western Australia [7]	50% rooftop DC isolator; 16% other isolator; 16% inverter.	Historical report subset. Included in a broader Australian collection, not an independent addition to it.
QBE, UK, 2025 [6]	23.1% DC connectors and cables; 17.0% panel; 10.8% storage; 9.0% inverter.	PV involvement rather than uniformly proven PV origin. Selected published groups do not exhaust the total.

What can be concluded across the series?

Connectors and DC cables are prominent in several sources, but they must be distinguished where the original evidence allows. DC isolators can dominate particular datasets. The evidence does not justify converting either observation into a universal minimum connector share. Original categories and different source populations remain visible rather than being concealed by one averaged percentage.

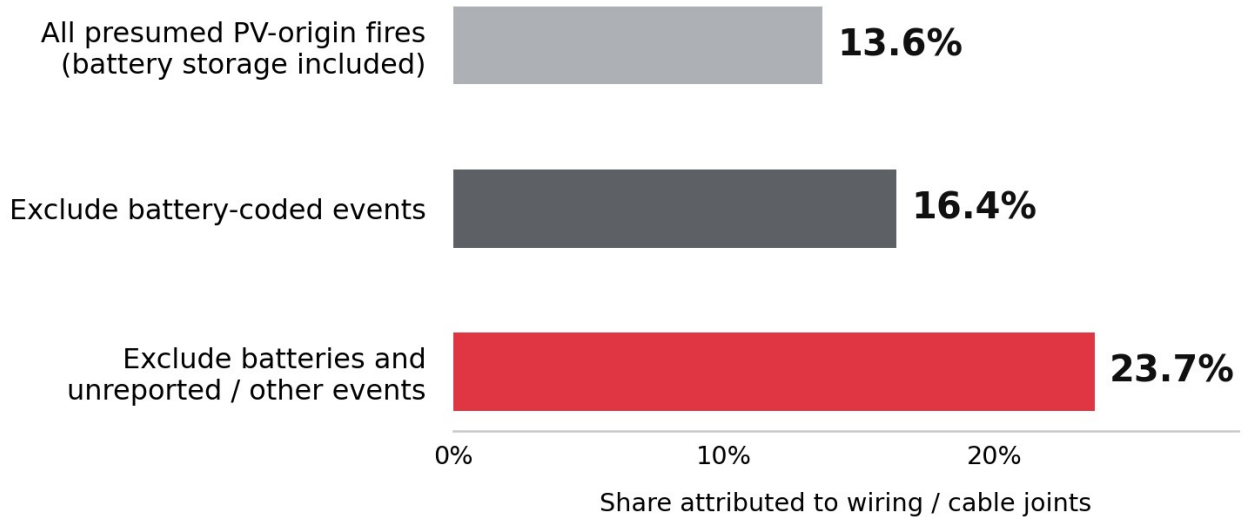
[1] [2] [3] [5] [6]

05 / READING THE PERCENTAGES

The denominator changes the answer

A percentage must identify **what it is a percentage of**. Removing unclassified or battery-origin events changes the question being answered, even when the number attributed to a component stays exactly the same.

Figure 2. Denmark: the same wiring/joint cases, three denominators



Own calculation from BRS Figure 3: 9 wiring/joint cases divided by 66, 55 and 38, respectively. Battery-coded events: 11; unreported/other: 17. This is a source-specific denominator check, not the sensitivity result for a pooled worldwide analysis. [4]

Why exclude unknown causes from a cause chart?

A chart of classified initiating components should not treat "unknown" as a physical cause. However, exclusion does not prove that missing cases have the same component distribution as classified cases. Severe damage, incomplete reporting or different investigation methods may leave different kinds of faults unresolved. The classified share and the unclassified share must both remain visible.

Why component ranking varies between studies

The observed distribution is affected by the composition of each source population, reporting practices and the treatment of uncertain incidents. Large case series can dominate a pooled calculation. For this reason, percentages in this publication are presented with their source populations rather than as a single worldwide ranking.

PERCENTAGE SHARE IS NOT FAILURE PROBABILITY

These figures describe the composition of recorded evidence. They do not estimate the chance that an installed connector, inverter or PV system will catch fire. That would require a relevant installed population and time at risk.

06 / INTERPRETATION

From initiating components to root causes

Initiating component, failure mechanism and underlying root cause require separate codes. Poor electrical contact, damaged insulation, moisture ingress, unsuitable equipment and product faults can produce overheating or arcing in different components. [9] [10]

Connectors: cross-mating, field termination and moisture

Cross-mating means joining connector halves from different manufacturers. Physical fit does not establish a suitable electrical connection. Laukamp et al. describe overheating in cross-mated pairs and arcing from poor field crimping. NEK guidance specifies connectors of the same type and manufacturer. Incorrect crimping, incomplete engagement and unsuitable terminations are therefore relevant mechanisms to record, not separate component groups. [9] [17]

IEC 62852 sets safety and test requirements for PV DC connectors. It does not provide a fire-cause percentage. Moisture or contamination can compromise connections and equipment; identify the affected component and the evidence for ingress rather than assigning every connection defect to cross-mating or a particular connector brand. [9] [10] [16]

In Clapham Park, London Fire Brigade attributed the fire probably to resistive heating at solar-panel terminals. That supports a connection-related interpretation, not identification of a particular MC4 product. In ARIA 63100, the account identifies damaged cables at an inverter-room entry; later inverter involvement is not evidence that the inverter electronics initiated the fire. [11] [12]

DC isolators: moisture and changing installation practice

The Humpty Doo investigation located ignition within a DC isolator. Poor installation was considered to have allowed moisture ingress and arcing. Internal switching contacts remain part of the isolator; they are not PV plug connectors. Conversely, a specifically identified failed plug or terminal at a switch can be coded as a connection fault. [9] [10]

Norwegian practice illustrates why historical component shares need context. NEK's explanation of the 2022 changes describes alternatives to a separate DC switch at building entry: placing the inverter outside or at the cable-entry point, or providing mechanical cable protection. Outdoor inverters must be suitable for outdoor use and the local environment. The guidance explains installation choices; it does not quantify a reduction in external DC switches or a subsequent increase in inverter fires. [17] [18]

06 / INTERPRETATION - CONTINUED

Why components fail

Laukamp et al. (2013) report installation faults at 37%, product defects at 35%, planning/design faults at 18% and external influences at 10% among identified likely root causes. Installation and planning together account for 55% in that historical material. The population includes fires and heat damage; it is separate from the component profile in Figure 1. [9]

Published root-cause category	Share
Installation fault	37%
Product defect	35%
Planning / design fault	18%
External influence	10%

Source: Laukamp et al., Figure 6, 2013; approximately 110 likely-cause cases. These shares are not added to component percentages. [9]

What has changed since 2013?

IEC 61215 addresses module design qualification and type approval; IEC 61730 addresses module safety qualification. Both have been revised since the 2013 study. Their existence or revision does not establish a measured decline in product-caused fires, nor an increase above 55% for installation and planning. Module standards also do not cover every product in a PV system. Current shares require comparable recent incident data; none are substituted for the historical percentages here. [19] [20]

Practical implication: verify the installed system

For Norwegian installations, verification should address NEK 400-6 together with the PV-specific documentation, commissioning tests and inspection covered by NEK IEC 62446-1 in the NEK 446 collection. Use the edition applicable to the installation. Record equipment and connector identity, installation checks, test results and the maintenance arrangements; a module product certificate is not verification of the assembled system. These are Norwegian-context references, not a statement of uniform legal requirements worldwide. [17] [21] [22]

07 / FIRE DEVELOPMENT

Ignition and fire spread are not the same

A component fault explains where a fire may start. The roof construction, module arrangement and nearby combustible material influence whether that local fire becomes a larger building fire. Cause prevention and consequence reduction are therefore separate parts of the same risk assessment. [13] [14]

The PV-roof assembly matters

Experiments show that the space beneath PV modules can alter heat feedback and fire spread. The UK Building Safety Regulator programme comprised 11 large-scale experiments. Every tested configuration incorporating PV showed greater flame spread than the control. This is evidence about the tested roof assemblies, not an ignition-frequency estimate. [13] [14]

Norwegian evidence: RISE Fire Research and NTNU/FRIC

Stølen, Fjærestad and Mikalsen's RISE Report 2022:83 describes 29 experiments on pitched-roof cavities, using simulated steel modules. Gap size and the initial fire affected spread and heat exposure; larger initial fires could propagate even with a 12 cm cavity. The report did not find an immediate risk of inward spread through the tested 22 mm chipboard deck. Its companion main report is 2022:82; they describe the same research programme, not independent incident series. [23]

NTNU/FRIC and RISE's related work is also presented in SINTEF's research communication. The design lesson is to consider gap, ignition exposure and roof materials together, not to infer one universally safe clearance or a cause percentage from these experiments. [23] [24]

Electrical quality control reduces ignition hazards. The installed roof assembly and any protective layers must also be assessed for the fire exposure that remains. Neither a component classification nor the survival of one material alone demonstrates the performance of every roof/PV combination. [14] [23]

Ground-mounted versus rooftop systems

The portal contains both types, but raw incident totals cannot establish which has the higher fire rate. Capacity, years in operation and differences in reporting must be considered. A ground-mounted installation may expose vegetation or nearby equipment; a rooftop installation may expose the building immediately below. These are consequence pathways, not proof of different ignition rates. [3] [15]

Residential versus non-residential buildings

Building use remains an analytical attribute, but the current material does not establish a robust, independent difference in component-cause distribution. Different equipment, system size, access for investigation and reporting can influence the observed pattern. A cause hypothesis is not confirmed merely because it appears more often in one selected building group. [3] [D1]

SCOPE OF THIS STUDY

The principal question is which components are implicated in initiating fires. Roof geometry, building type and fire spread are supporting analyses. They must not be substituted for the initiating cause or used to inflate the cause denominator.

08 / CONCLUSIONS

Conclusions and limitations

What the evidence actually establishes

1. Connection and cable faults are consistently important: 30% combined in IFS, approximately 25% combined in Sweden, and 23.1% combined in QBE. These are separate populations and should not be averaged as if they were one sample. [1] [2] [6]
2. DC isolators are prominent in specific series: 54% in the Queensland dataset and 50% roof-mounted DC isolators in the Western Australia subset. These findings cannot be generalised to all countries or every installation type. [5] [7]
3. Inverters and PV modules also recur. Their relative order differs between studies, and a burned component is not necessarily the originating fault. [3] [4]
4. Root causes are a separate, substantial finding: Fraunhofer/TÜV reports installation 37%, product 35%, planning/design 18%, and external influence 10% among its identified root causes (including thermal events). [9]

Overall conclusion: prioritise correct connector matching and termination, suitable switching equipment, appropriate environmental protection and documented system verification. These measures address preventable electrical faults. Separately, assess the roof/PV assembly to limit fire spread. Historical component and root-cause shares remain useful evidence, but they are not current-market probabilities or universal MC4 statistics. [9] [10] [16]-[24]

Limits that affect interpretation

Selection and reporting. The collection is not a probability sample of installed PV systems. Different sources capture different severities and event types.

Unresolved causes. A completed source review may still leave origin unknown. Unreviewed records are not equivalent to reviewed-but-unknown records.

Overlap and categories. Shared cases and reused datasets are not additional observations. Broad categories cannot be split without source evidence.

Access and review depth. Full reports, short notices and indexed excerpts are distinguished in the ledger. The study has not undergone independent peer review. [D1]

Scope of the quantitative findings

Figure 1 is Bridgehill's rescaling of the rounded weights in the Ong et al. synthesis, not a unique-event pooled estimate. Its 25.4% connector sector is not a measured cross-mating share; its 22.4% isolator sector is not a moisture-ingress share or a DC-only result. The wider portal evidence and source comparisons are retained separately. No verified combined unique-fire total or worldwide component distribution is reported. [8] [D1]

Author, publisher and interests

Thor Brubakken is the study author. Bridgehill is the publisher and operator of PV Fire Intelligence and develops FireBlock fire-protection products. This commercial interest is disclosed. The study does not independently validate a Bridgehill product, certification or performance claim.

Data availability: the v0.23 evidence workbook, source-review audit and v24 illustration calculations accompany the analytical record. Technical references checked for this revision are listed below; incident counts, source percentages and chart values are unchanged. No committee approval or endorsement is implied.

REFERENCES / 1 OF 3

Original publications and source series

Inline references link to the entries below. Portal links open the shared evidence base, not a verified individual-record route. Original-source links remain available for verification. Report page references follow printed page numbers unless stated otherwise.

[1] IFS (2026). Gefährliche Sonnenkraft? Brandschäden an Photovoltaikanlagen.

schadenprisma 1/2026. Investigation series; Figure 5, p. 12. Published rounded component shares; n = 244.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[2] Elsäkerhetsverket (2025). Bränder och brandtillbud i solcellsanläggningar - orsaker och trender 2018-2024.

Report 25EV5250. Figure 13, p. 19; n = 155. The approximately 25% connection/cable figure remains an approximate chart reading, not a published exact count.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[3] BRE / National Solar Centre. Fire and Solar PV Systems - Investigations & Evidence.

Report P100874-1004, issue 2.8 in the report; government-hosted Issue_2.9 file. Table 6 and root-cause table, p. 23; incident appendix and reporting discussion. Eighty incident rows.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[4] Beredskabsstyrelsen (2025). Brande i solcelleanlæg.

Factsheet. Figure 3: presumed-origin category counts, January 2020-June 2025; n = 66. Basis of the denominator calculations in Figure 2.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[5] Clean Energy Regulator (2020). Analysis of SRES Inspection Data to Assess Photovoltaic System Residual Systemic Electrical Safety Risks.

Table 2, p. 30: QFES Queensland series, 2014-2018; n = 100. Indicative PV-involvement data with stated limitations on component identification.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[6] QBE European Operations (2026). Solar panel fires increasing at more than double the rate of installations.

Insurer FOI analysis. For 2025, 212 PV-involved fires; selected cause-group counts: DC cables/connectors 49, panel 36, battery bank 23, inverter 19.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[7] Worcester Polytechnic Institute / Alternative Technology Association (2016). Fire Safety of Solar Photovoltaic Systems in Australia.

Student research report. Western Australia subset, Figure 21, p. 33 (PDF p. 46); n = 38. Not independent of the broader Australian source collection.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[8] Mohd Nizam Ong et al. (2022). Fault tree analysis of fires on rooftops with photovoltaic systems.

Journal of Building Engineering 46, 103752. DOI: 10.1016/j.job.2021.103752. Accepted manuscript, Tables 3-4 and Figure 5. Rounded secondary-synthesis weights are rescaled by Bridgehill for Figure 1; not independent pooled event counts.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

REFERENCES / 2 OF 3

Mechanisms, fire development and audit trail

[9] Laukamp et al. (2013). PV fire hazard - analysis and assessment of fire incidents.

28th EU PVSEC, Paris. Figure 6 and Sections 2.3-2.4: identified root causes and failure points in mixed fire/heat-damage material.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[10] NT WorkSafe. DC solar isolator fire.

Electrical safety alert: Humpty Doo. Internal isolator contacts and probable moisture-ingress pathway are distinguished from plug-connector failure.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[11] London Fire Brigade (2026). Flat fire - Clapham Park.

Incident notice, 11 September 2026. Probable resistive heating at solar-panel terminals. Public notice, not a complete laboratory investigation.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[12] BARPI / ARIA. Accident 63100.

Incident dated 27 March 2024. Cable damage and fire at an inverter-room entry. Source access and cause qualifiers are recorded in the case ledger.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[13] Kristensen, Jacobs and Jomaas (2022). Experimental Study of the Fire Dynamics in a Semi-enclosure Formed by Photovoltaic (PV) Installations on Flat Roof Constructions.

Fire Technology. DOI: 10.1007/s10694-022-01228-z. Experimental fire development; not an ignition-frequency dataset.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[14] Building Safety Regulator / Health and Safety Executive (2025). Fire spread over pitched roofs fitted with solar panels.

Published summary of 11 large-scale experiments. Results apply to tested assemblies; the summary is not a national incident-rate study.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[15] Netherlands Institute for Public Safety (2024). Zonneparken en natuurbranden.

Research report dated 19 December 2024. Ground-mounted PV and vegetation-fire context; relevant to consequences and exposure.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[16] IEC (2020). IEC 62852:2014+AMD1:2020.

Connectors for DC-application in photovoltaic systems - Safety requirements and tests. Public scope checked; not an interoperability or fire-incidence dataset.

[IEC scope](#)

[17] NEK (2023). Slik får du en fornøyd solcellekunde.

Official guidance, updated 5 March 2024. Same-type/same-manufacturer connectors, outdoor inverter suitability and handover documentation; 2022-edition context.

[Original guidance](#)

REFERENCES / 3 OF 3

Standards, Norwegian research and data record

These supplementary references support technical interpretation. Public standard scopes are not a clause-by-clause compliance assessment. Checked 20 October 2026.

[18] NEK (2022). Nye krav til DC-bryter i NEK 400:2022 skal forhindre brann.

Official explanation of the 2022 changes, updated 12 October 2023. Describes design alternatives and fire-spread protection, not measured switch-removal percentages.

[Original guidance](#)

[19] IEC (2021). IEC 61215-1:2021.

Terrestrial photovoltaic modules - Design qualification and type approval - Part 1: Test requirements. Public scope and revision summary, not a field fire-trend study.

[IEC scope](#)

[20] IEC (2023). IEC 61730-1:2023.

Photovoltaic module safety qualification - Part 1: Requirements for construction. Public scope; Part 2 addresses testing. No modern cause proportion is inferred.

[IEC scope](#)

[21] NEK. NEK 400:2026 - Elektriske lavspenningsinstallasjoner.

Official product scope identifies Part 6 as verification and testing. Cited for the verification framework, with the edition applicable to the installation retained.

[NEK scope](#)

[22] NEK. NEK 446-serien - Fotovoltaiske solenergisystemer.

Official scope: NEK IEC 62446-1 for system documentation, commissioning tests and inspection; subsequent parts address maintenance and thermography.

[NEK scope](#)

[23] Stølen, R.; Fjærestad, J. S.; Mikalsen, R. F. (2022). EBOB - Solcelleinstallasjoner på bygg.

Eksperimentell studie av brannspreiing i holrom bak solcellemodular på skrå takflater. Part 2: technical report. RISE Report 2022:83; summary pp. 2-6 and Sections 2-4. Same programme as main report 2022:82.

[Original report](#)

[24] SINTEF / Gemini (2023). Tre centimeter luft kan hindre brann mellom solcelleanlegg og tak.

Institutional research communication, 21 September 2023, describing the work of Stølen, NTNU, FRIC and RISE. Context only; no universal clearance or extra fire cases inferred.

[Research communication](#)

[P1] PV Fire Intelligence. Incident register and Research catalogue.

Operated by Bridgehill. Frozen public frame: 14 October 2026. Catalogue and incident records are the discovery base; original source authors retain attribution.

[PV Fire Intelligence - shared portal](#) | [Original source](#)

[D1] Bridgehill / Thor Brubakken (2026). Study evidence and calculation records.

PV_Fire_Causes_Evidence_Register_v23.xlsx; PV_Fire_Causes_Source_Review_Audit_v23.txt; PV_Fire_Causes_v24_Publication_Structure_EN.docx; PV_Fire_Causes_v24_Illustration_Calculations.xlsx. The audit and calculation records document source treatment and retain the underlying review history.

[PV Fire Intelligence - shared portal](#)