



ISCA ANNUAL REPORT 2026

Founding Edition

The State of the Global
Solar Cleaning Industry

Published by the International Solar Cleaning Academy (ISCA)

September 2026



Table of Contents

Foreword from the Chief Executive Officer

Introducing the inaugural ISCA Annual Report and outlining why a dedicated publication for the global solar cleaning industry has become necessary.

Executive Summary

A high-level overview of the key developments that shaped the solar cleaning industry throughout 2026 and the principal themes explored within this report.

Chapter 1

About ISCA

The evolution of the International Solar Cleaning Academy, its mission, its role within the global industry and the principles that guide its work.

Chapter 2

The Global Solar Cleaning Industry in 2026

An overview of the rapid growth of solar energy worldwide and the increasing importance of specialist cleaning and maintenance services in protecting asset performance.

Chapter 3

Safety Review 2026

An examination of the most significant safety issues affecting the industry, including electrical hazards, falls from height, overhead power lines, competency and emerging operational risks.



Chapter 4

Technology Review

A review of the technologies currently being deployed across the sector, including water-fed poles, robotic cleaning systems, dry-cleaning technologies, water treatment systems and future automation.

Chapter 5

ISCA During 2026

A summary of ISCA's principal developments during the year, including new training programmes, Company Accreditation, technical guidance, standards development and international growth.

Chapter 6

Looking Ahead to 2027

The trends, challenges and opportunities likely to shape the solar cleaning industry over the coming year.

Acknowledgements

Recognition of the organisations, industry professionals and contributors whose work continues to advance safety and professionalism throughout the global solar cleaning industry.

References

Technical publications, industry guidance, standards and research referenced throughout this report.



About This Report

Establishing a Baseline for the Global Solar Cleaning Industry

The ISCA Annual Report has been created to provide an independent, professional overview of the global solar cleaning industry and the factors influencing its continued development.

As the solar sector expands worldwide, the maintenance of photovoltaic assets is becoming an increasingly important part of the renewable energy lifecycle. Yet, despite the industry's rapid growth, relatively little information exists that focuses specifically on the operational, technical and safety considerations unique to professional solar panel cleaning.

This report has been developed to help address that gap.

Rather than serving as a promotional publication, the ISCA Annual Report is intended to become an annual reference document for contractors, asset owners, operations and maintenance providers, manufacturers, insurers, researchers, regulators and policymakers with an interest in the solar cleaning industry.

Its purpose is to encourage informed discussion, support continual improvement and document the evolution of an industry that continues to mature at an extraordinary pace.

The Founding Edition

The 2026 publication represents the Founding Edition of the ISCA Annual Report.

Every annual publication begins by establishing a baseline.

This inaugural edition captures the current state of the global solar cleaning industry, identifies the major trends influencing its development and explores many of the technical, operational and safety issues that are shaping professional practice today.

It is intentionally broad in scope and lays the foundation upon which future editions will build.

Looking Ahead

ISCA intends for this publication to become increasingly comprehensive each year.

Future editions are expected to incorporate a wider range of independently collected industry information, allowing meaningful year-on-year comparisons and the identification of long-term trends.

Subject to the availability of reliable data, future reports are expected to include:

01	Global Solar Cleaning Industry Survey results.
02	Annual benchmarking of contractor operations.
03	Industry pricing and commercial trends.
04	Safety incident analysis and emerging risk profiles.
05	Technology adoption trends.
06	Company Accreditation statistics.
07	Regional market comparisons.
08	Environmental performance and sustainability indicators.
09	Commentary on significant technical and regulatory developments affecting the industry.

By maintaining a consistent reporting framework, future editions will allow readers to monitor the industry's progress over time and better understand the opportunities and challenges that lie ahead.

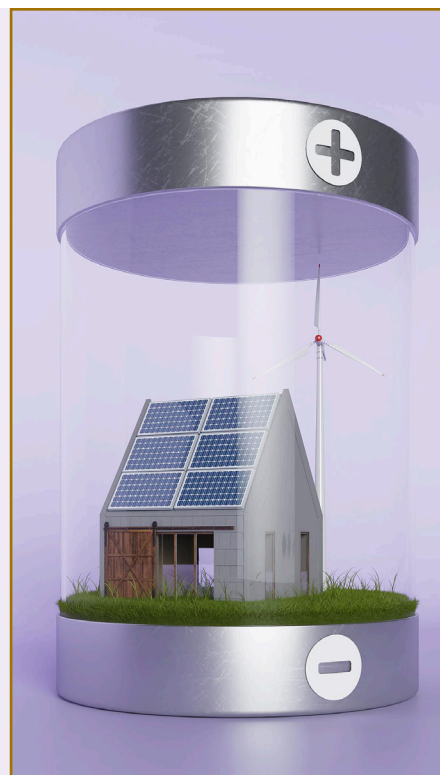
Contributing to Future Editions

The long-term value of this report will depend upon the quality of information contributed by the industry itself.

ISCA therefore encourages contractors, asset owners, operations and maintenance providers, equipment manufacturers, insurers, researchers and other stakeholders to participate in future industry surveys and data collection initiatives.

Where appropriate, information will be anonymised, aggregated and analysed to produce meaningful industry insights whilst respecting commercial confidentiality.

The objective is not simply to publish statistics, but to create a reliable body of knowledge that supports better decision-making across the global solar cleaning sector.



An Open Invitation

The ISCA Annual Report is intended to evolve alongside the industry it represents.

Readers are encouraged to share constructive feedback, suggest future topics for inclusion and contribute ideas that will help improve subsequent editions.

The solar cleaning industry has developed through collaboration, innovation and the willingness of professionals around the world to share knowledge and experience.

ISCA believes this report should reflect those same values.

Together, we have an opportunity to create an annual publication that documents the continued growth of the industry, promotes safer working practices and provides an enduring record of the evolution of professional solar panel cleaning.



This Founding Edition is the first step in that journey.



Foreword

Welcome to the inaugural **ISCA Annual Report**.

Solar energy has entered a new phase of maturity. Across the world, governments, investors and asset owners continue to deploy photovoltaic systems at unprecedented rates, recognising solar power as one of the cornerstones of the global transition towards cleaner energy.

As installed capacity has expanded, so too has the need to maintain these valuable assets safely and effectively.

For many years, solar panel cleaning was often regarded as an extension of traditional window cleaning or general exterior maintenance. Today, that perception is changing. Modern photovoltaic systems operate at increasingly high voltages, are installed across a diverse range of environments and employ technologies that demand a higher level of technical understanding than ever before. Cleaning a solar installation is no longer simply a cleaning task—it is work carried out in close proximity to live electrical equipment that requires appropriate planning, competence and risk management.

The International Solar Cleaning Academy (ISCA) was established to support that evolution.

Our objective has never been to create unnecessary barriers to entry, nor to promote one particular methodology or technology over another. Instead, our aim is to help develop a professional, evidence-based industry that places safety, competence and quality at the centre of its operations.

This report represents the first step towards a long-term commitment to documenting the development of the global solar cleaning sector.

Rather than attempting to provide every answer, this Founding Edition establishes a baseline from which future editions can build. As the years progress, ISCA intends to expand this publication with industry survey data, safety

trend analysis, technology adoption statistics, regional market intelligence and longitudinal benchmarking that will allow the industry to measure its own progress.

Throughout this report, readers will notice several recurring themes.

The first is growth. The solar industry continues to expand rapidly, bringing with it increasing demand for professional cleaning services.

The second is technology. Robotics, water treatment systems, specialist equipment and automation are reshaping how large-scale cleaning operations are delivered.

The third is professionalism. Customers increasingly expect documented procedures, competent personnel, appropriate insurance, formal training and demonstrable safety systems.

Finally, there is safety.

Despite significant progress across the industry, work around photovoltaic systems continues to expose personnel to hazards including falls from height, electrical shock, arc flash, overhead power lines, adverse weather and manual handling risks. As an industry, we have both an opportunity and a responsibility to learn from incidents, improve standards and continually raise expectations.

This publication has been prepared to contribute positively to that objective.

Whether you are a contractor, asset owner, operations and maintenance provider, manufacturer, insurer, consultant or regulator, we hope this report provides useful insight into a sector that continues to grow in both scale and importance.

The future of solar energy depends not only upon the successful deployment of photovoltaic systems, but also upon maintaining them safely, efficiently and professionally throughout their operational life.

We hope this report contributes, in some small way, towards that shared goal.

International Solar Cleaning Academy (ISCA)

September 2026





The CEO's Perspective

Solar Cleaning Is No Longer Just Cleaning

Every industry reaches a point where it quietly changes. Not overnight. Not because of one invention or one regulation. But because the world around it evolves faster than the industry's perception of itself.

I believe solar cleaning has reached that point.

For many years, solar panel cleaning has often been viewed as an extension of window cleaning, pressure washing or general exterior cleaning. That is understandable. Many of the pioneers who built this industry came from those professions, bringing with them valuable experience, entrepreneurial spirit and a willingness to explore an entirely new market.

Without those pioneers, there would be no solar cleaning industry. But industries evolve. The work we undertake today is fundamentally different from that carried out even ten years ago. Photovoltaic systems are larger. Operating voltages are higher. Commercial rooftops are more complex. Utility-scale solar farms have become vast pieces of critical infrastructure. Battery Energy Storage Systems are increasingly integrated with solar installations. Robotic cleaning systems are becoming commonplace. Asset owners expect documented procedures, competent personnel and structured safety management.

These changes have transformed not only the scale of the industry but also the responsibilities placed upon those who work within it. Yet public perception has not always kept pace. Too often, solar cleaning is still regarded as "just cleaning."

It isn't.

Cleaning itself remains only one component of the task. The greater responsibility lies in understanding the environment in which that cleaning takes place.

Every professional solar cleaner should understand that photovoltaic modules continue to generate electricity whenever exposed to light. They should recognise the hazards associated with damaged electrical equipment, fragile roof structures, overhead power lines, adverse weather conditions and increasingly complex energy infrastructure.

Equally important is understanding the limits of one's competence. Professionalism is not demonstrated by attempting every task. Professionalism is demonstrated by recognising when work falls outside your training, your experience or your authority. That judgement protects both workers and clients. As the industry matures, competence is becoming just as important as equipment.

For many years, investment focused primarily on developing better brushes, lighter poles, more efficient water treatment systems and increasingly capable robotic technologies. Those innovations have unquestionably advanced the industry.

However, the greatest investment we can now make is not in equipment.

The greatest investment we can now make is in people, knowledge, training, standards & leadership.

Technology can improve productivity. It cannot replace professional judgement.

One of the most encouraging developments I have observed during recent years is the industry's increasing willingness to embrace that reality. Contractors are investing in education. Manufacturers are improving equipment with greater consideration for operator safety. Asset owners are asking more informed questions. Insurers increasingly recognise the importance of documented procedures and competent management systems. These are all signs of a profession beginning to define itself. That evolution is both necessary and welcome.

Professional industries earn trust. They establish recognised standards. They develop specialist knowledge. They learn from incidents. They share good practice. They continually improve. Solar cleaning is beginning to do exactly that.

At ISCA, we often say that our objective is to improve safety, competence and professionalism throughout the industry. Those three words were chosen deliberately. Safety protects people. Competence builds confidence. Professionalism earns trust. Together, they form the foundation upon which every successful technical profession is built.

The purpose of this report is not simply to record where our industry stands today. It is to encourage discussion about where it should be tomorrow. If this Founding Edition achieves anything, I hope it encourages readers to view solar cleaning through a different lens. Not as a niche cleaning service. Not as an afterthought within operations and maintenance. But as a specialist profession that plays an increasingly important role in protecting some of the world's most valuable renewable energy assets.

The global transition to renewable energy will continue for decades to come. Photovoltaic systems will become larger, more advanced and more deeply integrated into national infrastructure. The responsibility of maintaining those assets will grow alongside them.

Our industry therefore has a choice. We can continue describing ourselves by what we do. Or we can begin defining ourselves by how professionally we do it.

I believe the future belongs to those who choose the second path.

Steve Williams

Founder

International Solar Cleaning Academy (ISCA)

September 2026

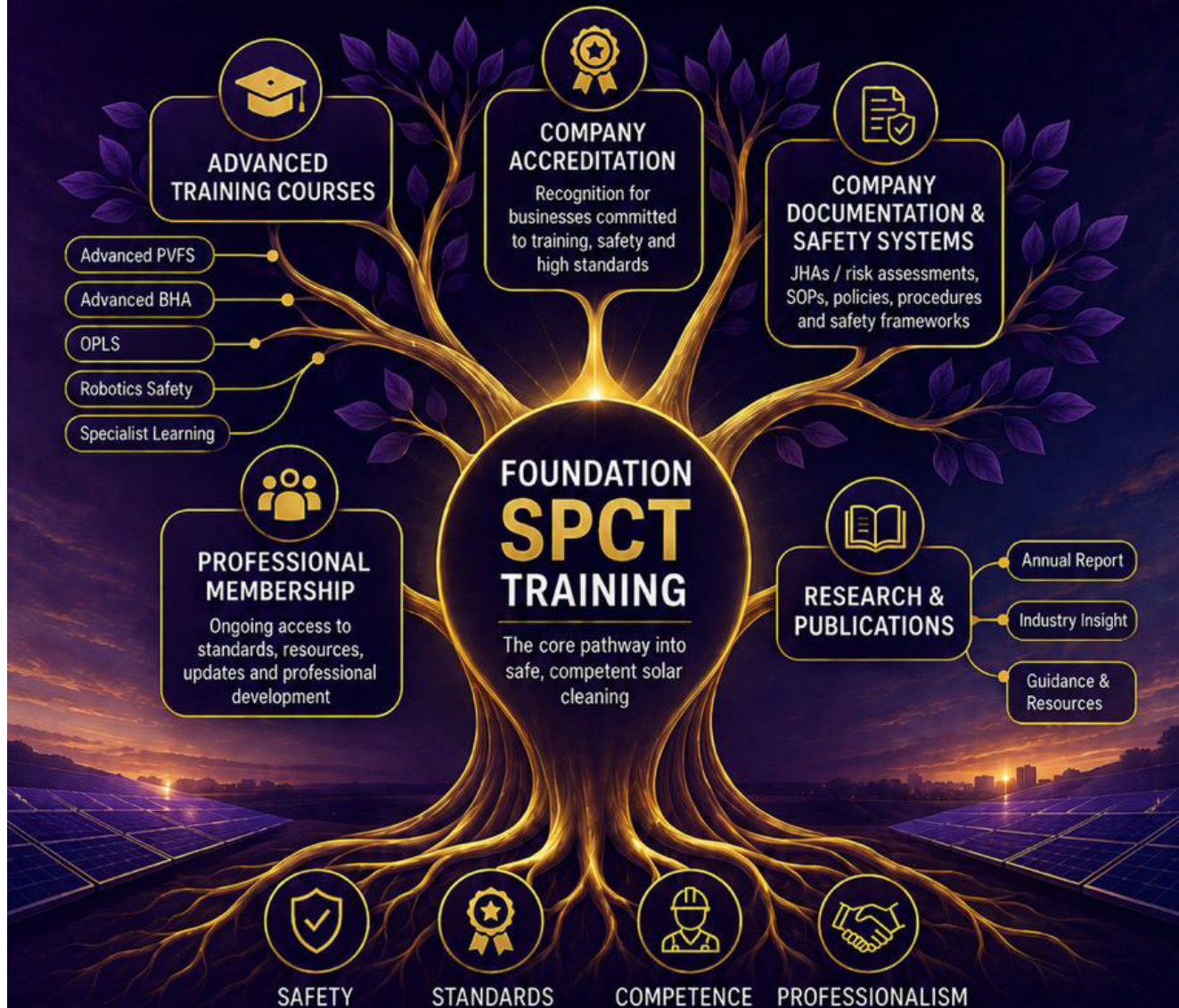


INTERNATIONAL SOLAR CLEANING ACADEMY

RAISING STANDARDS.
BUILDING PROFESSIONALS.

THE ISCA PROFESSIONAL ECOSYSTEM

How ISCA builds safer, stronger and more professional solar cleaning businesses



From training and accreditation to documentation, research and membership, **ISCA** supports the full professional journey of the solar cleaning community.



Executive Summary

The global solar industry continued its rapid expansion throughout 2026, reinforcing photovoltaic energy as one of the world's fastest-growing sources of electricity generation. As installed capacity increased across residential, commercial and utility-scale markets, so too did the importance of maintaining those assets to maximise performance, protect investment and support long-term energy production.

Alongside this growth, the solar cleaning industry continued its own transition from a relatively niche service into a recognised specialist discipline.

Cleaning methodologies have diversified significantly in recent years. Manual water-fed pole systems remain widely used across residential and commercial installations, while large-scale utility sites are increasingly adopting robotic cleaning systems, autonomous technologies and purpose-built mechanical solutions capable of improving productivity whilst reducing manual intervention. Water treatment technologies have also become increasingly sophisticated, allowing operators to achieve high-quality cleaning results with minimal environmental impact.

However, technological advancement has also highlighted the growing need for professional competence.

Photovoltaic systems operate continuously whenever exposed to light, presenting hazards that differ fundamentally from many traditional cleaning environments. Working in proximity to live electrical equipment, often at height and in challenging weather conditions, requires a level of planning and hazard awareness that continues to evolve across the industry.

Throughout 2026, electrical safety remained one of the defining topics within professional solar cleaning. Greater awareness of photovoltaic hazards, personal protective equipment, job planning and safe working practices has contributed to a broader industry conversation regarding competence, formal training and operational standards.

The International Solar Cleaning Academy continued to expand its contribution to that discussion during 2026 through the development of updated training programmes, Company Accreditation, technical guidance and specialist standards intended to support the continued professionalisation of the sector.

This Founding Edition of the ISCA Annual Report does not attempt to provide an exhaustive statistical review of the industry. Instead, it establishes a benchmark against which future editions can measure progress. Subsequent reports will incorporate longitudinal industry survey data, annual benchmarking, technology adoption trends, safety metrics and regional market analysis to provide an increasingly comprehensive picture of the global solar cleaning industry.

Several themes emerge consistently throughout this report:

				
The continued expansion of global photovoltaic capacity is increasing demand for professional maintenance services.	Safety remains the defining priority for organisations operating around live photovoltaic systems.	Technology continues to improve operational efficiency through robotics, automation and enhanced cleaning equipment.	Customers increasingly expect documented procedures, demonstrable competence and professional standards from contractors.	The industry is moving steadily towards greater standardisation, accreditation and technical maturity.

As solar energy continues to expand worldwide, the importance of safe, competent and professional maintenance will only increase. The purpose of this report is not simply to document that evolution, but to contribute constructively towards it.

ISCA hopes this publication becomes an annual resource that supports informed discussion, encourages continual improvement and helps establish a safer, more professional future for the global solar cleaning industry.



THE ISCA INDUSTRY SCORECARD

A SNAPSHOT OF THE SOLAR CLEANING INDUSTRY IN 2026

The ISCA Industry Scorecard provides a high-level view of key factors shaping the solar cleaning industry in 2026 and the direction of travel for each category.

CATEGORY	2026	TREND
 SAFETY AWARENESS	IMPROVING	 UPWARD TREND
 INDUSTRY PROFESSIONALISM	IMPROVING	 UPWARD TREND
 TRAINING ADOPTION	IMPROVING	 UPWARD TREND
 ROBOTICS ADOPTION	ACCELERATING	 UPWARD TREND
 INDUSTRY STANDARDISATION	EMERGING	 UPWARD TREND
 INSURANCE ACCESSIBILITY	CHALLENGING	 STABLE TREND
 MARKET COMPETITION	INCREASING	 UPWARD TREND



The solar cleaning industry continues to mature. While challenges remain—particularly around insurance accessibility and market competition—the overall direction is positive, with momentum building across key areas of growth and professional development.

Chapter 1

About ISCA



Building a Safer, More Professional Solar Cleaning Industry

The rapid growth of solar photovoltaic (PV) installations has transformed the global energy landscape. Once regarded as an emerging technology, solar power is now one of the world's fastest-growing sources of electricity generation, with millions of residential, commercial and utility-scale systems operating across every inhabited continent.

As this expansion has accelerated, a new specialist industry has developed alongside it: solar panel cleaning.

Maintaining photovoltaic modules is no longer viewed simply as an aesthetic exercise. In many environments, particularly where dust, pollen, pollution, agricultural activity or bird fouling accumulate, periodic cleaning plays an important role in helping asset owners maintain energy production, improve system performance and protect long-term investment.

Yet despite the rapid growth of both solar energy and the businesses that support it, the solar cleaning sector has historically developed without the same degree of standardisation found in many other technical industries.

Contractors have often entered the market from backgrounds such as window cleaning, pressure washing, facilities maintenance, rope access or industrial cleaning. While these industries bring valuable skills and experience, photovoltaic systems introduce hazards and operational considerations that are fundamentally different from conventional cleaning environments.

Unlike many electrical systems, solar modules continue to generate direct current whenever sufficient light reaches the cells. This means hazardous voltages may be present even when an installation has been isolated from the electrical grid. At the same time, contractors frequently work at height, around fragile roofing materials, in extreme weather conditions and, increasingly, alongside high-voltage infrastructure associated with large commercial and utility-scale solar assets.

These factors demand more than traditional cleaning experience alone.

They require an understanding of photovoltaic systems, electrical hazards, risk assessment, appropriate personal protective equipment, work planning and the limitations of both equipment and personnel.

The International Solar Cleaning Academy (ISCA) was established in response to this need.

ISCA is an independent training and standards organisation dedicated to improving safety, competence and professionalism throughout the global solar cleaning industry. Its purpose is to support contractors, asset owners, operations and maintenance providers, insurers, manufacturers and other stakeholders by promoting evidence-based guidance and encouraging consistent standards of professional practice.

Rather than advocating a single cleaning methodology, manufacturer or equipment supplier, ISCA seeks to provide practical guidance that enables organisations to make informed decisions appropriate to their own operational environment.

Our Mission

ISCA's mission is straightforward:

To improve safety, competence and professionalism throughout the global solar cleaning industry through education, standards and accreditation.

This mission is underpinned by three core principles.

Safety First

No increase in production, efficiency or commercial performance justifies exposing workers to unnecessary risk.

Solar cleaning should always be planned and undertaken with safety as the primary consideration. This includes recognising electrical hazards, implementing suitable control measures, selecting appropriate equipment and ensuring personnel possess the competence necessary for the work being undertaken.

Competence Through Education

Professional industries rely upon knowledgeable, competent practitioners.

ISCA believes that education should extend beyond equipment operation to include hazard recognition, electrical awareness, planning, emergency procedures, environmental considerations and the continual development of technical knowledge as photovoltaic technology evolves.

Raising Industry Standards

The long-term success of the solar cleaning industry depends upon public confidence.

Clients increasingly expect contractors to demonstrate competence, maintain documented procedures, carry appropriate insurance and operate in accordance with recognised good practice.

By promoting standards, guidance and accreditation, ISCA aims to support organisations in demonstrating that commitment to professionalism.

What ISCA Does

ISCA's activities focus on several interconnected areas that collectively support the continued development of the industry.

Professional Training

ISCA develops structured training programmes covering the knowledge and practical considerations required for safe and effective solar panel cleaning.

Training addresses subjects including photovoltaic system awareness, electrical hazards, personal protective equipment, risk assessment, fire safety, overhead power lines, environmental considerations and emerging technologies.

The objective is not only to teach operational procedures but to develop informed decision-making and professional judgement.

Standards and Best Practice

As the industry evolves, clear technical guidance becomes increasingly important.

ISCA develops standards, best practice guidance and technical documents intended to promote consistency, improve safety outcomes and encourage evidence-based decision-making throughout the sector.

These publications are designed to evolve alongside technological and regulatory developments rather than remain static documents.

Accreditation

Professional accreditation provides independent recognition that an organisation has demonstrated a commitment to structured systems, competence and continual improvement.

ISCA's Company Accreditation programme has been developed to recognise organisations that can evidence appropriate management systems, operational procedures and professional practices aligned with the principles promoted by the Academy.

Industry Engagement

The challenges facing the solar cleaning industry cannot be addressed by any single organisation acting alone.

ISCA actively supports collaboration between contractors, manufacturers, asset owners, insurers, regulators and industry associations in order to encourage knowledge sharing and continual improvement.

A Global Perspective

Although solar markets differ significantly between countries, many of the industry's core challenges are universal.

Whether cleaning residential rooftops in Europe, commercial installations in North America, utility-scale solar farms in Australia or desert-based projects in the Middle East, contractors encounter many of the same questions regarding safety, competence, water management, equipment selection and operational efficiency.

For this reason, ISCA adopts a global perspective whilst recognising that regional legislation, regulations and industry practices will continue to vary.

The objective is not to replace local regulatory requirements but to complement them through internationally applicable guidance and professional education.

Looking Forward

The solar cleaning industry remains relatively young compared with many established technical professions.

Its standards continue to evolve, technologies continue to advance and expectations regarding competence continue to increase.

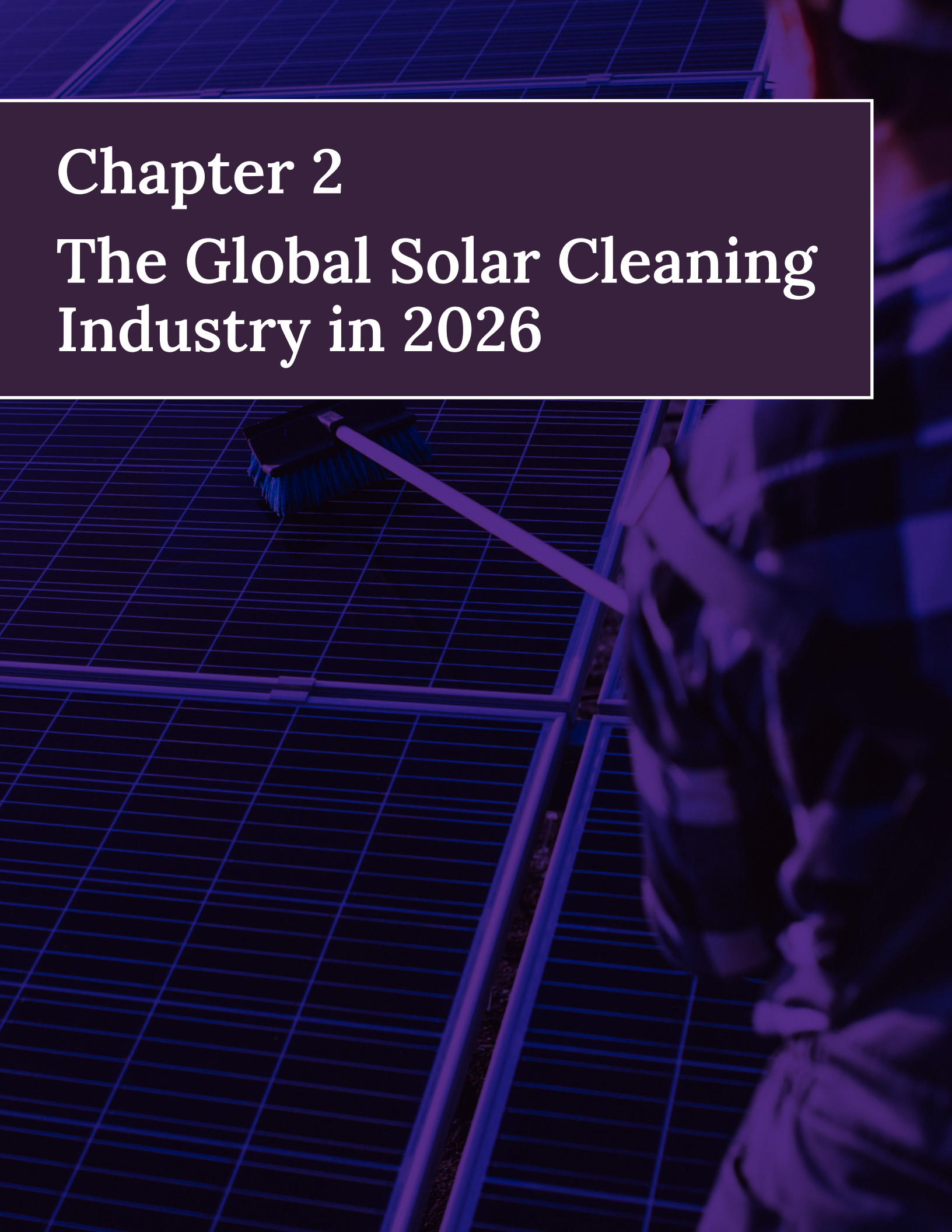
The publication of this inaugural Annual Report reflects ISCA's belief that the industry benefits from objective analysis, open discussion and the sharing of knowledge.

As future editions build upon the foundations established here, ISCA intends to expand this report with additional benchmarking, industry surveys, safety analysis and market intelligence that will help contractors, asset owners and policymakers better understand the continuing evolution of the sector.

The future of solar cleaning will not be defined solely by technological innovation.

It will also be shaped by the industry's willingness to invest in knowledge, competence, collaboration and professional standards.

That is the purpose of ISCA, and it is the purpose of this report.

A person wearing a white shirt and a white hard hat is cleaning a large array of solar panels. They are using a long-handled brush with blue bristles. The solar panels are arranged in rows and have a grid pattern. The background is a clear blue sky.

Chapter 2

The Global Solar Cleaning Industry in 2026

An Industry Coming of Age

The global solar industry continued its remarkable expansion throughout 2026, reinforcing photovoltaic (PV) energy as one of the world's fastest-growing sources of electricity generation. Governments, utilities, businesses and homeowners continue to invest heavily in solar energy as part of wider efforts to improve energy security, reduce carbon emissions and lower the long-term cost of electricity generation.

Behind every installed photovoltaic system lies a fundamental operational requirement: maintaining the performance of that asset throughout its service life.

Whilst module technology has advanced significantly over the past two decades, no commercially deployed photovoltaic module has been demonstrated to remain permanently free from environmental contamination without intervention. Dust, pollen, industrial pollution, agricultural residue, bird fouling, sea salt, airborne particulates and biological growth all contribute to soiling that can reduce energy production over time.

As a result, professional solar cleaning has evolved from a specialist service offered by relatively few contractors into an increasingly recognised component of asset management.

The industry is no longer defined simply by the act of cleaning photovoltaic modules. Instead, it has become an integral part of operations and maintenance (O&M), helping owners maximise energy yield, preserve return on investment and extend the effective operational life of valuable renewable energy assets.

A Diverse Industry

One of the defining characteristics of the solar cleaning industry is its diversity.

Across the world, contractors vary enormously in size, experience and operational capability.

Some organisations specialise exclusively in utility-scale solar farms covering hundreds or thousands of acres.

Others focus on commercial rooftop installations, schools, warehouses, distribution centres and manufacturing facilities.

Many continue to provide residential cleaning as part of broader exterior maintenance services alongside window cleaning, pressure washing or building maintenance.

This diversity has encouraged innovation but has also resulted in considerable variation in operational practices, equipment selection and safety management.

Unlike more established industries, no single operating model has emerged as the universal standard.





Market Drivers

Several factors continue to drive demand for professional solar cleaning services.

Continued Growth in Installed Capacity

The most obvious driver remains the continued expansion of global photovoltaic deployment.

Each newly commissioned solar installation represents an asset that may require inspection, maintenance and, where appropriate, cleaning throughout its operational life.

As installed capacity continues to increase, the addressable market for professional cleaning services naturally expands alongside it.

Increasing Focus on Asset Performance

Solar assets are now widely regarded as long-term infrastructure investments.

Owners and operators increasingly monitor performance using sophisticated monitoring systems capable of identifying relatively small changes in energy production.

As monitoring technology improves, operators are better able to identify when soiling may be affecting performance and can make more informed decisions regarding maintenance scheduling.

Rather than viewing cleaning solely as a reactive activity, many organisations now incorporate it within planned asset management strategies.

Professionalisation of Operations & Maintenance

The broader O&M sector has matured considerably over recent years.

Asset owners increasingly expect contractors to provide documented procedures, competent personnel, appropriate insurance, formal training and evidence of structured safety management.

This trend has encouraged solar cleaning businesses to adopt more professional management systems and invest in staff development.

The Evolution of Cleaning Technologies

Perhaps no aspect of the industry has evolved more rapidly than cleaning technology.

While manual water-fed pole systems continue to dominate residential and many commercial applications, large-scale solar farms are increasingly deploying purpose-built robotic cleaning equipment capable of operating across extensive arrays with minimal manual intervention.

Modern robotic systems now offer a range of operating models, including remotely operated, semi-autonomous and increasingly autonomous solutions.

Alongside robotics, significant advances have also been made in:

01	Lightweight carbon fibre cleaning systems
02	Pure water production technologies
03	Specialised rotating brush systems
04	Vehicle-mounted cleaning equipment
05	Large-scale tractor-mounted cleaning systems
06	Remote inspection technologies
07	Digital job management platforms

The result is an industry that is becoming progressively more technically sophisticated each year.

Water and Dry Cleaning

One of the most frequently discussed topics within the industry concerns the use of water.

In many environments, purified water remains the most effective method of removing accumulated soiling whilst minimising residue.

However, increasing attention is also being given to reducing water consumption, particularly within arid regions where water availability represents both an environmental and commercial consideration.

This has accelerated interest in dry-cleaning technologies, robotic systems and alternative cleaning methods capable of reducing overall water demand.

Rather than a single universally applicable solution, different environments increasingly require different maintenance strategies depending upon climate, soiling characteristics, available water resources and economic considerations.

The Myth of “Self-Cleaning” Solar Panels

During the early years of the photovoltaic industry, references to “self-cleaning” modules appeared regularly within marketing literature.

While advances in glass coatings and module design have improved resistance to certain forms of contamination, real-world operational experience has demonstrated that no commercially available photovoltaic module remains permanently free from soiling under all environmental conditions.

Rainfall may remove some loose contaminants under favourable conditions, but it cannot be relied upon as a universal cleaning mechanism.

As the global installed base has matured, owners and operators have increasingly recognised that appropriate maintenance remains an important component of long-term asset management.

Consequently, claims suggesting that photovoltaic modules require no cleaning should be viewed cautiously and evaluated against actual site conditions rather than theoretical assumptions.

A Growing Emphasis on Competence

As technology advances, expectations regarding contractor competence continue to increase.

Modern solar cleaning frequently involves working around live electrical equipment, at height, on fragile roof structures and within operational industrial environments.

These conditions demand more than practical cleaning experience alone.

Increasingly, clients seek contractors capable of demonstrating structured planning, appropriate risk assessment, suitable personal protective equipment, documented procedures and evidence of workforce competence.

This trend is expected to continue as larger institutional investors and infrastructure owners place greater emphasis on governance, safety performance and contractor assurance.

Challenges Facing the Industry

Despite its continued growth, several significant challenges remain.

The industry continues to experience inconsistent approaches to training and competency assessment.

Insurance availability varies considerably between jurisdictions and may remain difficult or costly for contractors undertaking higher-risk work.

Pricing pressure persists within many markets, with some contractors competing primarily on cost rather than competence or service quality.

Rapid technological development also presents challenges.

Contractors must continually evaluate new equipment, robotic systems and maintenance methodologies whilst ensuring that innovation does not outpace appropriate safety management or operator training.

Finally, the industry continues to operate within a regulatory environment that differs significantly between countries, requiring organisations to navigate a complex landscape of occupational safety legislation, electrical standards and client-specific requirements.

Looking Ahead

The solar cleaning industry enters the second half of the decade in a position of considerable opportunity.

Global photovoltaic deployment shows little sign of slowing, whilst asset owners increasingly recognise the importance of effective operations and maintenance throughout the lifecycle of their installations.

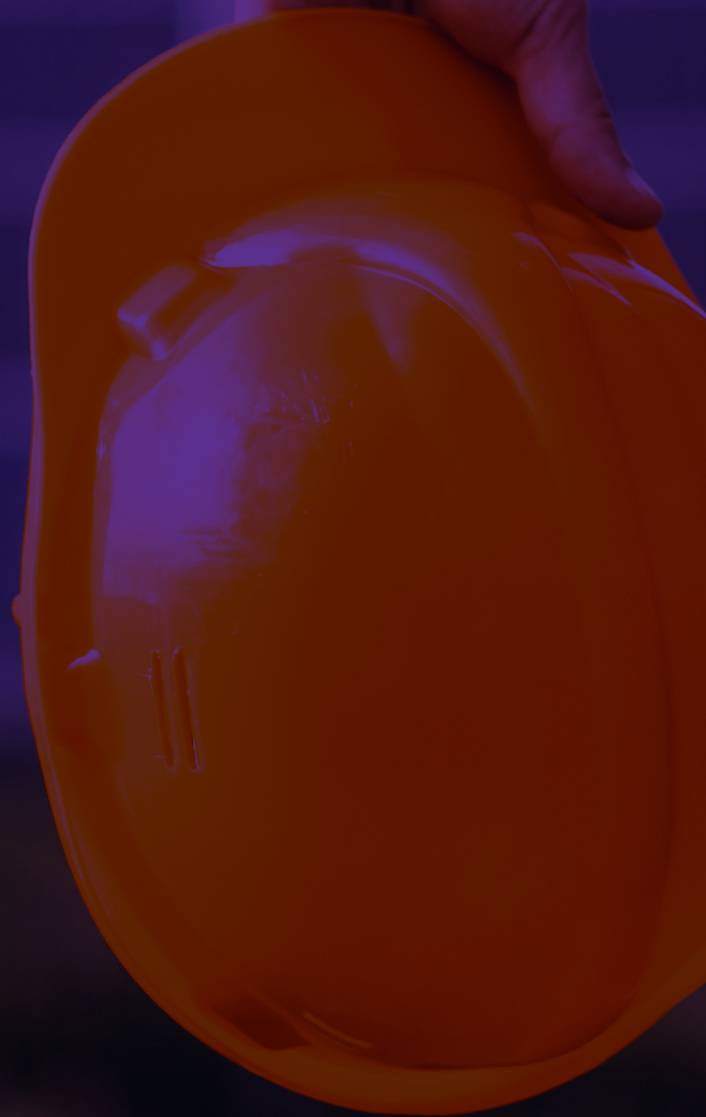
Technology continues to improve efficiency. Professional standards continue to mature. Training opportunities continue to expand. Most importantly, the industry itself is evolving from a collection of individual service providers into a recognised specialist profession.

The pace of that evolution will depend not only upon technological innovation but also upon the willingness of contractors, manufacturers, asset owners and industry organisations to work collaboratively in raising standards, improving competence and sharing knowledge.

The years ahead are therefore likely to be remembered not simply for continued growth in installed solar capacity, but for the emergence of a more mature, more professional and increasingly safety-conscious global solar cleaning industry.

Chapter 3

Safety Review 2026



The Defining Challenge for a Growing Industry

Every profession reaches a point where safety becomes a defining measure of its maturity.

For aviation, continual learning from incidents has become embedded within the industry's culture. Construction has developed comprehensive systems for managing workplace risk.

As the global solar cleaning industry continues to mature, safety is becoming one of its defining characteristics.

Solar panel cleaning is often perceived as a relatively straightforward maintenance activity. In reality, it is frequently undertaken in environments where multiple high-consequence hazards exist simultaneously. Contractors may work at height, in adverse weather, around live photovoltaic equipment, near overhead electrical infrastructure and on fragile roof surfaces, often while handling specialist equipment over extended periods.

As the industry expands, the ability to manage these hazards consistently and professionally will play a significant role in determining its long-term reputation and sustainability.

Safety is no longer simply an operational consideration. It is becoming a defining characteristic of professional solar cleaning.

Building Upon Established Safety Frameworks

The solar cleaning industry does not operate in isolation.

Across the world, contractors work within established occupational health and safety legislation and technical standards developed by recognised authorities. Depending upon jurisdiction, these may include organisations such as the Occupational Safety and Health Administration (OSHA), the National Fire Protection Association (NFPA), the Health and Safety Executive (HSE), Standards Australia, the Canadian Centre for Occupational Health and Safety (CCOHS), and other national regulators and standards bodies.

These organisations establish the legal and technical frameworks that govern safe work within their respective countries.

ISCA's role is different.

Rather than replacing national legislation or recognised industry standards, ISCA seeks to provide specialist guidance that addresses the unique challenges associated with cleaning photovoltaic systems and supports organisations in applying existing health and safety principles within the context of solar panel cleaning.

Professional contractors should always ensure their work complies with the legislation, regulations and standards applicable within the jurisdictions in which they operate.

ISCA's role is evolving into that of an advisory body for those who govern industry standards, they increasingly draw upon ISCA's knowledge to define safe working conditions for solar panel cleaners.

An Evolving Risk Profile

The nature of photovoltaic installations has changed considerably over the past decade. Modern solar installations are larger, more technically sophisticated and increasingly integrated into critical infrastructure. Commercial rooftops routinely support extensive photovoltaic arrays, whilst utility-scale solar farms now cover hundreds or even thousands of acres.

Operating voltages continue to increase. Battery Energy Storage Systems (BESS), sophisticated monitoring technologies and high-voltage distribution infrastructure are becoming increasingly common. As these systems evolve, so too do the risks associated with maintaining them.

The solar cleaning industry must continue to evolve alongside the assets it is responsible for maintaining.

High-Consequence Hazards

Although every worksite presents unique circumstances, several hazards consistently require careful planning and effective control.

Working at Height

Falls from height remain among the most significant risks associated with rooftop solar cleaning.

Roof edges, skylights, fragile roofing materials, wet surfaces and changing weather conditions all contribute to an environment that demands careful planning before work begins.

Professional contractors increasingly incorporate structured site assessments, appropriate access methods, fall protection systems where required and dynamic risk assessment into normal working practice.

The objective should always be to eliminate or reduce risk wherever reasonably practicable before relying upon personal protective equipment alone.

Electrical Hazards

Photovoltaic systems present a working environment unlike many conventional electrical installations.

Solar modules continue producing direct current whenever exposed to sufficient light, regardless of whether the installation has been disconnected from the electrical grid. Understanding this distinction is fundamental.

Cleaning itself is not electrical work, but it frequently takes place in close proximity to energised electrical equipment. Consequently, contractors should understand the limits of their competence, recognise potential hazards and avoid undertaking work that falls outside the scope of their training or authorisation.

Increasingly, clients also expect contractors to demonstrate an understanding of electrical safety principles appropriate to photovoltaic environments.

Overhead Power Lines

The continued growth of utility-scale solar developments has increased the frequency with which contractors encounter overhead electrical infrastructure.

Long-reach cleaning equipment, telescopic poles and elevated working platforms all require careful planning when overhead conductors are present.

Identifying these hazards during site planning, maintaining appropriate approach distances and ensuring personnel understand exclusion zones are becoming increasingly important aspects of professional operations.

Greater awareness of overhead power line safety represents one of the most significant developments currently emerging within the industry.

Environmental Conditions

Solar cleaning is frequently undertaken in challenging environmental conditions.

Extreme heat, prolonged sun exposure, wind, rain and changing weather patterns all influence both safety and operational decision-making.

Heat stress, dehydration and fatigue may develop gradually and can significantly affect concentration and judgement before obvious symptoms become apparent.

Professional planning should therefore consider environmental conditions as carefully as the technical aspects of the cleaning operation itself.

Manual Handling and Ergonomics

Advances in equipment design have significantly improved operational efficiency. Nevertheless, manual handling remains an important consideration.

Repeated use of long-reach poles, movement of filtration equipment, hose management and transportation of specialist equipment all place physical demands upon personnel.

Increasing attention is therefore being given to ergonomics, equipment weight, operator fatigue and working techniques that improve both productivity and long-term wellbeing.

Competence Before Equipment

The continued development of specialist equipment has transformed solar cleaning. However, equipment alone cannot guarantee safe outcomes. Competence remains the single most important control measure.

Professional contractors require an understanding of photovoltaic systems, site-specific hazards, emergency procedures, risk assessment and the limitations of both equipment and personnel.

Technology should enhance competent decision-making rather than replace it.

A Developing Safety Culture

One of the most encouraging developments observed across the industry is the increasing emphasis on proactive safety management.

Clients increasingly request evidence of competence. Contractors are investing more heavily in documented procedures and workforce development. Manufacturers are designing equipment with greater consideration for operator safety. Insurers continue to place greater emphasis upon structured risk management. Collectively, these developments reflect an industry moving towards greater professionalism.

Learning From Experience

Every mature industry improves by learning from experience. Open discussion of incidents, near misses and lessons learned provides opportunities to prevent future harm.

As the solar cleaning sector continues to evolve, greater collaboration between contractors, manufacturers, asset owners, insurers, regulators and training organisations will help ensure that valuable lessons are shared rather than repeated.

Developing a culture of continuous improvement may ultimately prove more valuable than any individual technological innovation.

Looking Forward

The pace of innovation within the photovoltaic sector shows no sign of slowing. Larger installations, increased automation, robotic cleaning technologies and new energy storage systems will continue to reshape the industry's operating environment. Against this backdrop, safety must evolve at the same pace.

The future of professional solar cleaning will depend not only upon technological advancement, but also upon maintaining high standards of competence, embracing continual learning and working within recognised health and safety frameworks.

ISCA believes that the strongest industries are those that combine innovation with responsibility, and that the continued success of solar cleaning will ultimately be measured not only by the performance of the assets maintained, but by the ability of every worker to return home safely at the end of each working day.

Chapter 4

Technology Review 2026





Innovation Driving a New Generation of Solar Cleaning

Few industries have evolved as rapidly over the past decade as solar energy. The same can increasingly be said for solar cleaning. What was once characterised by relatively simple manual cleaning methods has developed into a technically diverse industry employing advanced materials, robotic systems, sophisticated water treatment technologies and increasingly data-driven maintenance strategies.

Innovation is no longer focused solely on improving cleaning performance. It is equally concerned with improving safety, reducing environmental impact, increasing productivity and lowering the lifetime operating costs of photovoltaic asset maintenance.

The technologies available to contractors today would have been almost unrecognisable only a decade ago.

The Continuing Role of Manual Cleaning

Despite rapid technological development, manual cleaning remains the most widely adopted approach throughout much of the world.

Residential properties, commercial rooftops, schools, retail premises and many industrial buildings continue to rely upon trained operatives using lightweight telescopic water-fed pole systems combined with purified water.

The continued popularity of manual cleaning reflects several advantages.

Properly selected equipment remains highly adaptable, comparatively inexpensive to deploy and capable of accessing installations where larger mechanical systems may not be practical.

However, modern manual cleaning bears little resemblance to earlier methods.

Today's professional equipment incorporates lightweight composite materials, modular brush systems, improved ergonomics and increasingly sophisticated water management technologies designed to improve both operator safety and cleaning performance.

Robotics Move Into the Mainstream

Perhaps the most significant technological development within the industry has been the rapid growth of robotic cleaning systems.

Initially deployed primarily within large utility-scale solar farms, robotic technologies are now becoming increasingly common across commercial installations as equipment capabilities continue to improve. Modern robotic systems offer several operational advantages.

They can reduce operator fatigue, improve consistency across large installations and increase productivity where cleaning programmes involve extensive repetitive work.

Robotics may also reduce exposure to certain workplace hazards by limiting the amount of time personnel spend directly within operational cleaning environments. Nevertheless, robotics should not be viewed as replacing skilled operators. Instead, they represent another specialist tool requiring competent planning, appropriate supervision and effective maintenance.

As with any technology, successful implementation depends upon selecting the right solution for the specific operating environment.

Dry Cleaning Technologies

Growing concern regarding water availability has accelerated interest in dry-cleaning systems.

This is particularly evident within arid regions where water resources are limited or where transporting purified water across remote utility-scale installations presents operational challenges.

Modern dry-cleaning technologies employ a variety of approaches, including rotating brush systems, robotic cleaning platforms and specialist mechanical cleaning equipment designed to remove loose particulate contamination without the routine application of water.

These systems have demonstrated considerable potential within appropriate operating environments. However, dry cleaning is not universally applicable. Site-specific factors such as contaminant type, environmental conditions, humidity, bird fouling, pollen accumulation and oily residues continue to influence cleaning effectiveness.

The industry's future is therefore unlikely to be characterised by a single preferred methodology. Instead, successful contractors will increasingly select technologies based upon local operating conditions and client requirements.

Water Treatment Continues to Advance

Water quality remains one of the defining elements of professional solar cleaning. Purified water technologies have advanced significantly in recent years.

Reverse osmosis systems, deionisation technologies and integrated filtration systems now enable contractors to produce consistently high-quality purified water capable of minimising spotting and residue following cleaning.

Portable treatment systems have also become more compact, more efficient and easier to operate, allowing professional standards to be maintained across increasingly diverse operating environments.

Water management is also receiving greater attention. Reducing water consumption without compromising cleaning performance is becoming an important objective for many organisations, particularly within regions facing increasing environmental pressures.

Materials and Equipment Design

Innovation is also evident in the equipment itself.

Manufacturers continue to develop lighter, stronger and more durable composite materials that reduce operator fatigue whilst improving equipment longevity.

Carbon fibre remains widely used where low weight and high stiffness are required, although ongoing research into insulation, durability and structural performance continues to influence equipment design.

Brush technology has similarly evolved.

Modern brush systems now offer a range of configurations designed to address different soiling conditions, module types and cleaning environments.

The trend towards modular equipment allows contractors to adapt systems quickly without replacing complete assemblies.

Increasing attention is also being given to ergonomics, recognising that equipment capable of reducing operator fatigue contributes to both productivity and long-term occupational health.

Data-Driven Maintenance

Technology is influencing not only how cleaning is performed but also when it is performed.

Asset owners increasingly utilise monitoring platforms capable of identifying reductions in performance that may indicate soiling or other maintenance requirements.

Rather than relying solely upon fixed cleaning schedules, operators are increasingly incorporating performance data into maintenance planning.

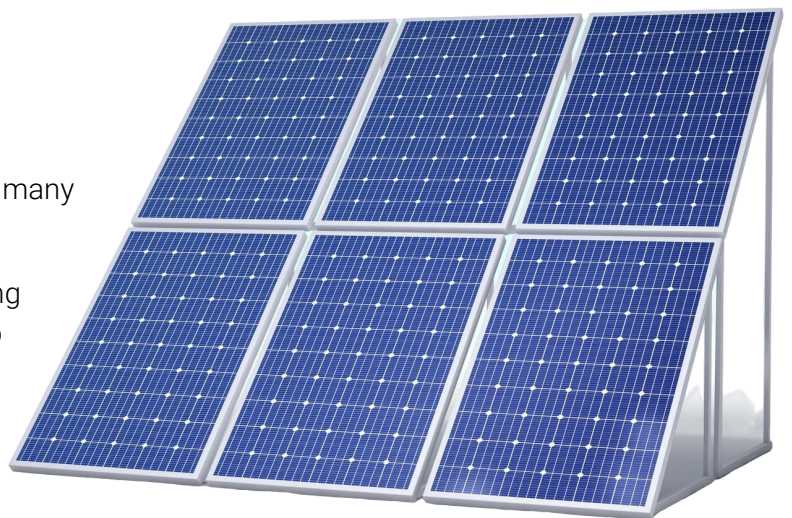
This allows cleaning resources to be deployed more efficiently whilst supporting informed operational decision-making.

As monitoring technologies continue to improve, maintenance programmes are expected to become progressively more targeted and evidence based.

Artificial Intelligence and Automation

Artificial intelligence is beginning to influence many aspects of the renewable energy sector.

Although widespread adoption within solar cleaning remains in its early stages, AI has the potential to support route planning, maintenance scheduling, predictive asset management, image recognition, defect identification and operational reporting.



Combined with advances in robotics and remote inspection technologies, artificial intelligence may significantly reshape maintenance planning over the coming decade.

However, technological capability should continue to be balanced against practical operational requirements, appropriate human oversight and effective risk management.

Technology Must Support Safety

One of the most important developments within the industry is the growing recognition that innovation should improve safety as well as productivity.

Equipment that reduces manual handling, improves operator ergonomics, increases working distances or reduces exposure to workplace hazards represents a significant step forward for the profession.

Nevertheless, no technology removes the need for competent operators.

Regardless of the sophistication of the equipment employed, successful solar cleaning continues to depend upon effective planning, appropriate training and professional judgement.

Technology should be viewed as enabling safer and more efficient work rather than replacing the need for competent people.

Looking Ahead

The pace of technological development within the solar cleaning industry is unlikely to slow. Robotic systems will continue to evolve. Artificial intelligence will become increasingly integrated into maintenance planning. Water treatment technologies will improve further. Equipment will become lighter, stronger and more efficient.

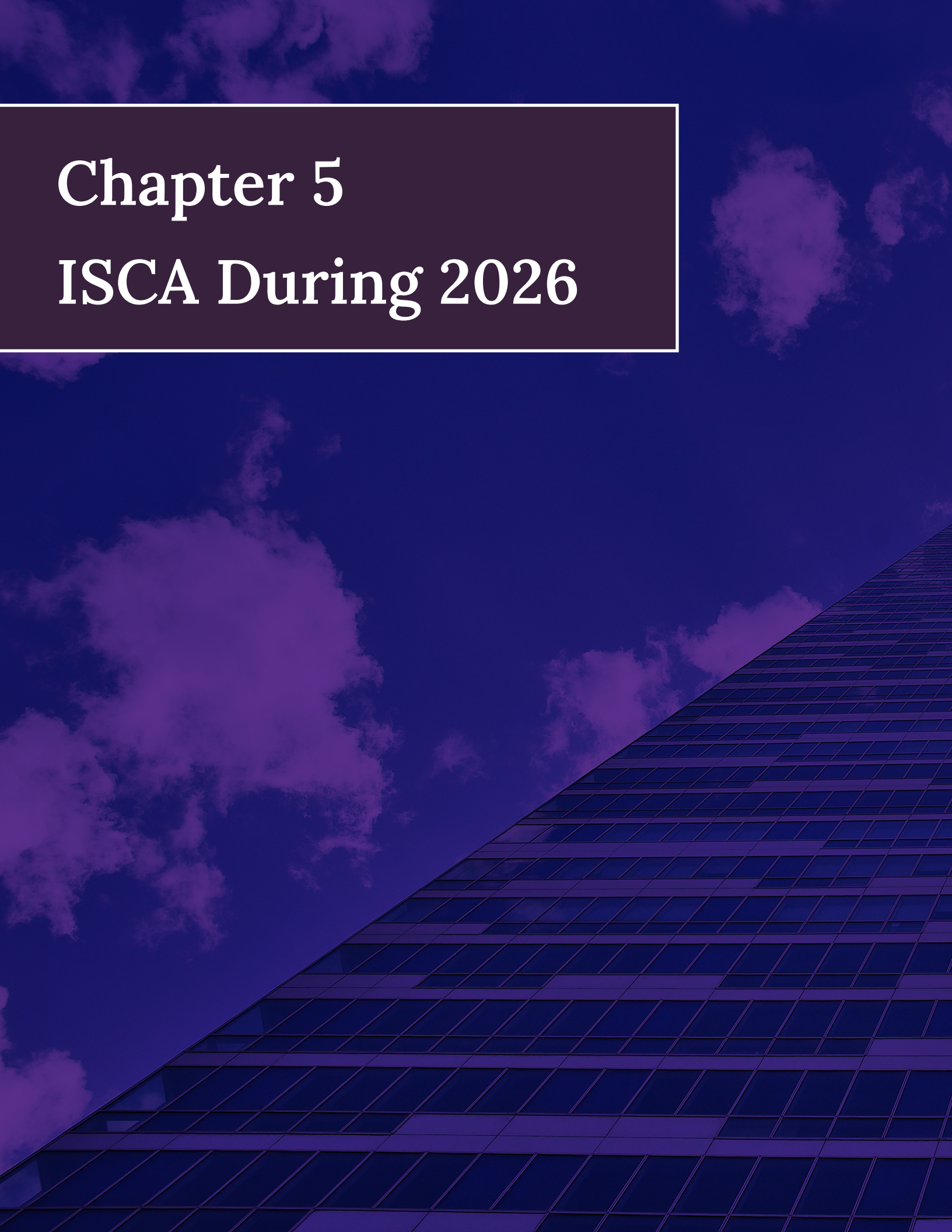
At the same time, the industry's expectations regarding competence will continue to rise.

The most successful organisations are unlikely to be those adopting every new technology as it emerges. Rather, they will be those capable of evaluating innovation objectively, selecting equipment appropriate to their operating environment and integrating new technologies without compromising safety or quality.

Technology will continue to shape the future of solar cleaning. Professionalism will determine how successfully that technology is applied.

Chapter 5

ISCA During 2026



A Year of Foundation Building

For the International Solar Cleaning Academy, 2026 was a year defined not simply by growth, but by purpose.

The Academy entered the year with a clear objective: to continue raising standards of safety, competence and professionalism throughout the global solar cleaning industry.

Rather than focusing solely on expanding training provision, ISCA sought to strengthen the wider professional framework that supports the industry. This included the continued development of structured education, company accreditation, technical guidance, professional standards and international collaboration.

Whilst much of this work takes place behind the scenes, its collective aim is straightforward—to help create an industry that is safer, more consistent and better prepared for the challenges accompanying the continued expansion of solar energy worldwide.

Training Programmes Continue to Evolve

Education remained central to ISCA's activities throughout 2026.

During the year, the Academy completed a significant revision of its flagship Foundation Solar Panel Cleaning Technician programme.

The imminent release of Foundation Solar Panel Cleaning Technician (SPCT) Version 7.0 represents the most comprehensive update to the course since its introduction.

The revised programme places greater emphasis on photovoltaic system awareness, electrical hazards, job planning, risk assessment, appropriate personal protective equipment and current industry practices, reflecting both technological developments and the increasing expectations placed upon professional contractors.

Alongside the Foundation programme, ISCA also completed a major revision of its **Advanced PV Fire Safety** course. Released as **Version 2.0**, the updated programme incorporates the latest operational learning, aligns more closely with current photovoltaic safety guidance and expands its focus on emergency planning, fire prevention and safe decision-making around photovoltaic systems.

Together, these programmes continue to form the core of ISCA's professional training pathway.

Version 1.0 of the Bird Hazard & Legal Awareness (BHA) course was also launched. This course has the aim of informing contractors about the health hazards that arise from working near bird droppings, nests, eggs and chicks. ISCA has identified trends that see illegal disposal of nests, eggs and chicks, so addresses this in the legality side of the course.

This course will assist contractors not only to work healthily and safely, but also legally with what can be a very sensitive subject in the eyes of many, animal welfare.

Expanding the Curriculum

As the solar cleaning industry matures, new risks and specialist disciplines continue to emerge.

Recognising this, ISCA continued to expand its portfolio of specialist training during 2026.

Development of the **Advanced Overhead Power Line Safety (OPL)** course is nearly complete and will mark an important step in addressing one of the industry's less frequently discussed, yet potentially catastrophic, hazards.

With utility-scale solar developments increasingly operating alongside electrical transmission infrastructure, greater awareness of overhead power line safety has become an essential element of professional competence.

The Academy also continued to strengthen its specialist training in areas including photovoltaic fire safety and bird hazard awareness, reflecting the increasingly diverse operational environments encountered by contractors.

Company Accreditation

One of the most significant milestones achieved during 2026 was the launch of **ISCA Company Accreditation**.

The programme was developed due to demand, as companies seek to demonstrate a commitment to structured systems, documented procedures and continual professional improvement.

Unlike individual certification, which recognises personal competence, Company Accreditation evaluates organisational systems and management practices that contribute to safe and professional service delivery.

The introduction of Company Accreditation reflects the growing expectations of asset owners, insurers and commercial clients, many of whom increasingly seek evidence that contractors operate within structured management systems rather than relying solely upon individual experience.

ISCA anticipates that the programme will continue to develop in the years ahead as greater numbers of organisations seek independent recognition of their professional standards.

Standards Development

Throughout 2026, ISCA continued work on its developing series of technical standards and best practice guidance documents, not least the comprehensive ISCA 100 Standard, due for release in Q4 of 2026.

These publications are intended to support consistency across the industry by providing practical guidance on subjects directly relevant to photovoltaic cleaning operations.

Topics under development include personal protective equipment, electrical hazard awareness, work planning, competence, overhead power lines, equipment selection and operational best practice.

Rather than replacing national legislation or recognised international standards, these documents are designed to complement existing regulatory frameworks by addressing issues specific to professional solar cleaning.

The publication of further standards remains an important priority for the Academy.

Industry Engagement

ISCA continued to strengthen relationships across the wider renewable energy and cleaning industries during 2026.

The Academy contributed to technical discussions, collaborated with manufacturers and industry organisations, supported the development of guidance documents and continued engagement with contractors operating across multiple international markets.

Professional dialogue remains an important component of ISCA's approach. The continued development of the solar cleaning industry depends upon collaboration between contractors, equipment manufacturers, insurers, asset owners, regulators and training organisations.

ISCA remains committed to supporting that collaboration wherever practical.

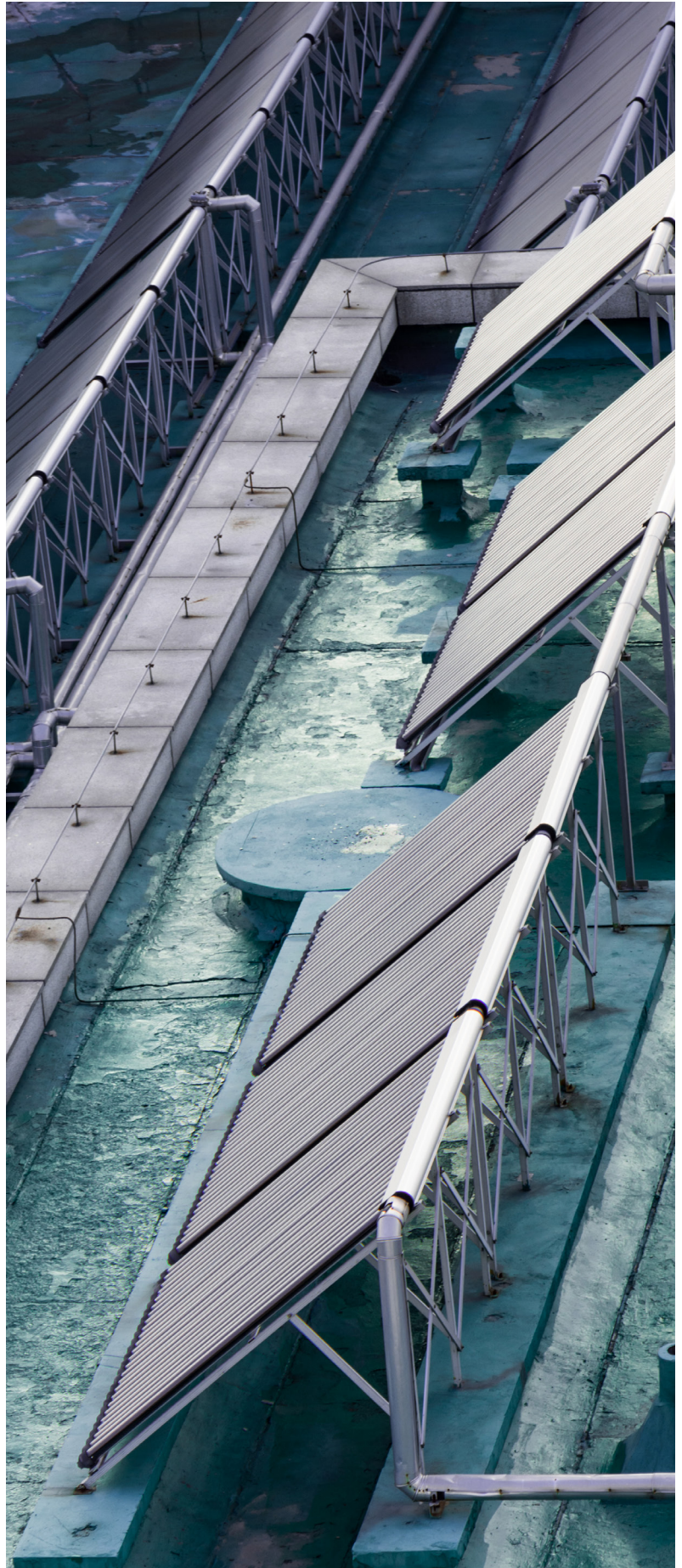
Sharing Knowledge

Beyond formal training, the Academy continued to place considerable emphasis on education through technical publications, articles, professional guidance and industry communications.

Throughout the year, ISCA contributed to wider discussion on subjects including photovoltaic safety, maintenance practices, contractor competence and evolving industry standards.

By encouraging open discussion and the sharing of practical knowledge, the Academy seeks to support continual improvement throughout the profession.

Knowledge shared widely benefits the industry as a whole.



Looking Beyond Training

Perhaps the most significant development during 2026 was not the launch of any single programme or initiative. Rather, it was the continued evolution of ISCA itself.

Increasingly, the Academy's role extends beyond delivering training courses. Its activities now encompass education, accreditation, technical guidance, standards development, professional engagement and the promotion of evidence-based best practice.

Collectively, these initiatives contribute towards a broader objective: supporting the long-term professionalisation of the solar cleaning industry.

As the industry continues to mature, organisations increasingly seek trusted sources of specialist knowledge that understand the unique challenges associated with photovoltaic maintenance.

ISCA intends to continue developing that role in partnership with the wider industry.

Looking Ahead

The work undertaken during 2026 represents only the beginning.

Further standards, additional specialist training programmes, expanded international collaboration, enhanced guidance documents and the continued growth of Company Accreditation are expected to form key priorities during the coming years.

At the same time, ISCA will continue encouraging dialogue across the sector through research, technical publications and future editions of this Annual Report.

The challenges facing the global solar cleaning industry are evolving rapidly. Meeting those challenges will require innovation, collaboration and an ongoing commitment to professional development.

ISCA looks forward to playing its part in supporting that journey.



2026 By the Numbers



Global PV Capacity

More than 2 terawatts (TW) of cumulative solar photovoltaic capacity is now installed worldwide, making solar one of the fastest-growing sources of electricity generation in history. Continued investment across residential, commercial and utility-scale markets is expected to drive further rapid expansion throughout the remainder of the decade.

Largest Solar Markets

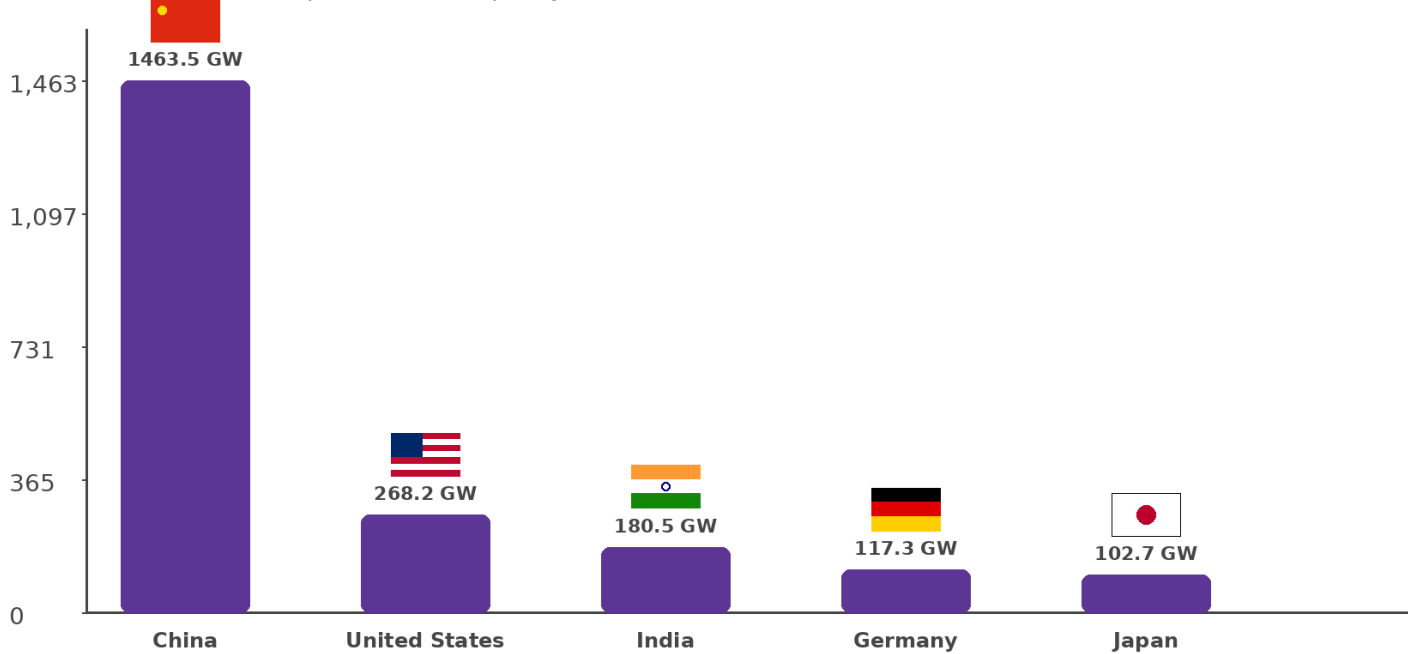
By Installed PV Capacity

Rank	1	2	3	4	5
					
Country	China	United States	India	Japan	Germany

Together, these five countries account for a significant proportion of the world’s installed photovoltaic capacity and continue to influence technological development, operations and maintenance practices, and investment across the global solar sector.

The World's Five Largest Solar PV Markets

Cumulative installed photovoltaic capacity (end of 2025)



Source: IEA PVPS Snapshot of Global PV Markets 2026 (end-2025 cumulative capacity)

Utility-Scale Growth

Utility-scale solar remains the fastest-growing segment of the photovoltaic industry.

Key trends observed during 2026 include:

- Continued development of multi-hundred-megawatt solar farms.
- Increasing integration of Battery Energy Storage Systems (BESS).
- Greater deployment of robotic cleaning technologies.
- Increased investment from infrastructure funds and institutional investors.
- Growing emphasis on predictive maintenance and performance monitoring.

As project sizes continue to increase, efficient operations and maintenance—including appropriate cleaning strategies—are becoming increasingly important to long-term asset performance.

Typical Operational Life of PV Modules

Modern photovoltaic modules are generally designed for an **operational life of 25–35 years**, with many manufacturers offering performance warranties extending to **25 or 30 years**.

Although annual power degradation varies between products and operating conditions, maintaining module cleanliness and carrying out routine inspections can help ensure systems continue operating as intended throughout their design life.

Typical Cleaning Frequencies

Cleaning frequency should always be determined through site-specific assessment. Local climate, rainfall, airborne dust, agricultural activity, industrial pollution, bird fouling, vegetation and financial return on investment all influence maintenance requirements.

The table below provides general industry guidance only.

Environment	Typical Cleaning Frequency
High rainfall / low soiling regions	Every 12–24 months, or as required
Residential rooftop systems	Every 12–24 months, depending on local conditions
Commercial rooftops	Every 6–12 months
Industrial facilities	Every 3–12 months, depending on contamination levels
Agricultural environments	Every 3–6 months during high-soiling periods
Desert and arid utility-scale sites	Monthly to quarterly, depending on soiling rates and performance monitoring
Coastal environments	Site-specific, based on salt deposition and environmental conditions

Note: There is no universally correct cleaning interval. Increasingly, asset owners are using performance monitoring, soiling measurements and economic analysis to determine the optimum cleaning frequency for individual sites rather than relying on fixed maintenance schedules.

Five Industry Trends to Watch

Looking Towards 2027 and Beyond

The solar cleaning industry continues to evolve alongside the wider photovoltaic sector. While no forecast can predict every technological or commercial development, several trends are already shaping the future of professional solar panel maintenance.

1. Autonomous Robotics Will Continue to Expand

Robotic cleaning systems are rapidly moving from specialist equipment to mainstream operational tools, particularly within utility-scale solar farms.

Advances in autonomous navigation, battery technology, artificial intelligence and remote monitoring are expected to improve productivity whilst reducing operator exposure to repetitive and physically demanding tasks.

Although manual cleaning will continue to play an important role across residential and commercial markets, robotics are likely to become an increasingly common feature of large-scale operations over the coming decade.

The challenge for contractors will be determining where robotic systems deliver genuine operational value and where conventional cleaning methods remain the more practical solution.

2. Electrical Competence Will Become Increasingly Important

As photovoltaic installations increase in both size and operating voltage, expectations regarding electrical hazard awareness are also rising.

Asset owners, insurers and principal contractors are placing greater emphasis on documented competence, structured risk assessment and an understanding of the hazards associated with working around energised photovoltaic systems.

Future success is likely to depend not only on cleaning ability, but also on demonstrating a professional understanding of the wider operating environment.

Training, continuing professional development and specialist safety knowledge are expected to become increasingly important differentiators within the industry.

3. Independent Accreditation Will Gain Momentum

Across many technical industries, independent accreditation has become an important method of demonstrating professionalism and organisational competence.

The solar cleaning sector is expected to follow a similar path.

As commercial clients seek greater assurance regarding contractor capability, structured management systems, documented procedures and recognised third-party accreditation are likely to become increasingly influential during procurement.

Rather than relying solely upon experience or reputation, organisations may increasingly be expected to demonstrate measurable standards of quality, safety and continual improvement.

4. Floating Solar Will Create New Operational Challenges

Floating photovoltaic (FPV) installations represent one of the fastest-growing sectors of renewable energy.

As deployment accelerates, maintenance strategies will need to evolve accordingly.

Unlike conventional rooftop or ground-mounted systems, floating solar introduces additional considerations including water access, buoyancy systems, slip hazards, changing weather conditions and specialised access equipment.

Cleaning methodologies, equipment design and safety procedures are all expected to continue developing as this emerging sector matures.

5. Battery Energy Storage Systems Will Influence Maintenance Planning

Battery Energy Storage Systems (BESS) are becoming increasingly integrated with commercial and utility-scale photovoltaic installations.

While solar cleaners will not ordinarily undertake work on battery systems themselves, the growing presence of BESS will inevitably influence site planning, emergency procedures, access arrangements and overall operational risk management.

Understanding the wider energy infrastructure associated with modern solar installations will become an increasingly valuable component of professional competence.

Industry Challenges

Five Challenges That Will Shape the Future of Solar Cleaning

The global solar cleaning industry has made significant progress in recent years. Professional standards continue to improve, technology is advancing rapidly and awareness of safety has never been greater.

However, like every developing profession, important challenges remain.

Addressing these issues will require collaboration between contractors, asset owners, manufacturers, insurers, training providers, regulators and industry organisations. None of these challenges will be solved by a single company or organisation acting alone.

The following five issues are likely to have the greatest influence on the continued professionalisation of the industry over the coming years.

1. Establishing Professional Competence

Perhaps the greatest challenge facing the industry is defining what constitutes a competent solar cleaning professional.

Whilst many countries regulate work at height, electrical safety and occupational health, there remains no internationally recognised minimum competency framework specifically for professional solar panel cleaning.

As a result, expectations vary considerably between regions, clients and contractors.

As photovoltaic systems become larger, more technically sophisticated and increasingly integrated with critical energy infrastructure, establishing consistent expectations for competence will become progressively more important.

Professional industries are built upon recognised knowledge, structured training and continual development. The solar cleaning sector is beginning that journey, but there is still considerable work ahead.

2. Insurance and Risk Perception

Obtaining appropriate insurance continues to present challenges for many contractors.

In some markets, insurers have limited experience of the solar cleaning industry and may assess risk using information drawn from unrelated sectors. This can result in inconsistent underwriting, restricted policy availability or premiums that do not accurately reflect the measures taken by professional contractors to manage risk.

As the industry matures, improved communication between insurers, contractors and industry organisations will be important in developing a clearer understanding of operational risks and encouraging insurance products better suited to the sector.

Greater consistency in standards, training and documented safety management may also help improve confidence across the insurance market.

3. Pricing and Commercial Sustainability Perception

Growing demand for solar cleaning services has inevitably increased competition. Competition benefits clients by encouraging innovation and improved service delivery. However, competition based solely on price can place pressure on investment in training, equipment, safety systems and workforce development.

Professional maintenance should be evaluated not only on cost but also on competence, safety, reliability and long-term value.

As asset owners become increasingly sophisticated in their procurement processes, contractors who demonstrate quality, professionalism and structured management systems are likely to be better positioned for long-term success than those competing on price alone.

Sustainable businesses are built on sustainable pricing.

4. Modernising Manufacturer Cleaning Guidance

Solar module manufacturers have made significant progress in providing maintenance recommendations to customers. However, the quality and scope of cleaning guidance continues to vary considerably across the industry.

Some documents remain highly detailed, while others provide only limited information or continue to reference cleaning methods that no longer reflect common industry practice.

Modern solar cleaning has evolved considerably.

Utility-scale robotic systems, rotating brush technologies, advanced water treatment equipment and specialised maintenance techniques are now routinely employed across many markets.

Future guidance should continue evolving alongside these technologies, providing asset owners and contractors with practical, evidence-based recommendations that reflect the realities of modern photovoltaic maintenance.

Improved consistency across manufacturer guidance would benefit the entire industry by supporting clearer expectations and reducing uncertainty for contractors and asset owners alike.

5. Changing Public Perception

Despite its increasing technical complexity, solar cleaning is still frequently viewed as simply another form of exterior cleaning.

In reality, today's contractors often work around live photovoltaic systems, high-voltage infrastructure, battery energy storage systems, fragile roof structures and increasingly sophisticated monitoring technologies.

The industry therefore faces an important challenge.

It must continue demonstrating that professional solar cleaning requires more than the ability to clean photovoltaic modules. It demands technical understanding, structured planning, sound judgement and a commitment to safe working practices.

Changing public perception will not happen through marketing alone.

It will be achieved through consistently high professional standards, improved education, greater collaboration and the continued development of a competent, safety-conscious workforce.

Looking Forward

Every profession encounters defining challenges as it evolves.

The solar cleaning industry is no different.

The issues identified in this report should not be viewed as weaknesses. Rather, they represent opportunities for improvement and indicators of a profession that is continuing to mature.

Many of today's challenges are already being addressed through technological innovation, greater collaboration and an increasing commitment to professionalism across the sector.

Progress will not be measured by the absence of challenges, but by the industry's willingness to confront them openly, learn from experience and work collectively towards practical solutions.

Recognising these challenges is the first step towards solving them.





Final Thoughts

The pace of change within the solar cleaning industry continues to accelerate.

New technologies, evolving customer expectations and increasing investment in renewable energy are reshaping both the opportunities and responsibilities facing contractors worldwide.

Not every prediction contained within this report will unfold exactly as anticipated.

However, one trend appears certain.

The future of the industry will belong to organisations that combine innovation with professionalism, embrace continual learning and remain committed to delivering safe, competent and high-quality maintenance throughout the operational life of photovoltaic assets.

The coming decade promises to be one of the most significant periods of development the solar cleaning industry has yet experienced.

Acknowledgements

The International Solar Cleaning Academy (ISCA) extends its sincere appreciation to the organisations, businesses and individuals who have contributed to the continued development of the global solar cleaning industry throughout 2026.

The publication of this inaugural **ISCA Annual Report** would not be possible without the support, collaboration and shared commitment of contractors, manufacturers, equipment suppliers, asset owners, operations and maintenance providers, researchers and safety professionals across the renewable energy sector.

Solar Panel Cleaning Convention (SPCC)

ISCA would like to recognise and thank the sponsors, exhibitors and supporters of the 2025 **Solar Panel Cleaning Convention (SPCC)**.

Their commitment to education, innovation and industry collaboration has helped establish an event dedicated exclusively to the advancement of professional solar panel cleaning.

2025 Solar Panel Cleaning Convention Sponsors & Partners

RHG Tucker	Solar Shine
XERO	Zalvus Tech
Solar Clean Techs	Chemitek
SolarCleanso	HyCleaner
SunBrush Mobil	Unger
Window Cleaning Resource (WCR)	Solarrow
Expert Safety Services	J. Racenstein Company
Slick Tools	Veteran Solar Cleaning
Inti-Tech	

ISCA gratefully acknowledges the confidence these organisations placed in the Convention and their shared commitment to raising professional standards throughout the industry.

Industry Organisations

ISCA also recognises the important work undertaken by professional associations, technical organisations and occupational health and safety bodies that continue to shape safe working practices and technical excellence throughout the renewable energy sector.

These include, but are not limited to:

01	Occupational Safety and Health Administration (OSHA) Based in USA
02	National Fire Protection Association (NFPA) Based in USA
03	Health and Safety Executive (HSE) Based in UK
04	International Window Cleaning Association (IWCA) Based in USA
05	Power Washers of North America (PWNA) Based in USA
06	Interstate Renewable Energy Council (IREC) Based in USA

ISCA recognises the valuable contribution these organisations make in advancing workplace safety, technical standards, renewable energy and professional competence.

The Global Solar Cleaning Community

Finally, ISCA extends its thanks to the thousands of professionals working throughout the solar cleaning industry.

From independent contractors and specialist cleaning companies to manufacturers, engineers, consultants, researchers, trainers, insurers and asset owners, every organisation committed to improving safety, professionalism and technical excellence contributes to the continued success of the industry.

The growth of solar energy depends not only upon the deployment of photovoltaic systems, but also upon the skilled professionals responsible for maintaining them throughout their operational life.

This report is respectfully dedicated to everyone working to make the global solar cleaning industry safer, more professional and better prepared for the future.



DRIVING SAFETY. RAISING STANDARDS. BUILDING THE FUTURE.

A global professional organisation dedicated to advancing safety, competence and professionalism in solar cleaning.



SAFETY

Every person working around solar systems deserves to return home safely.



EDUCATION

Knowledge and training empower professionals and strengthen the industry.



COLLABORATION

Stronger together. Working with industry partners to achieve shared goals.



INNOVATION

Embracing technology and new ideas to improve safety and drive performance.



PROFESSIONALISM

Building a culture of integrity, accountability and continual improvement.

ABOUT ISCA

The International Solar Cleaning Academy (ISCA) was founded in 2022 to meet the growing need for specialist education, technical guidance and professional standards within the photovoltaic maintenance industry.

Through education, standards, accreditation, research and collaboration, ISCA supports the continued professional development of solar cleaning companies and technicians worldwide.



Every solar panel cleaned safely.
Every technician working competently.
Every company committed to continual improvement.

Together, we are building the future of professional solar cleaning.

CONNECT WITH ISCA

-  www.theisca.org
-  info@theisca.org
-  International Solar Cleaning Academy (ISCA)
-  International Solar Cleaning Academy
-  Global Outreach. Local Impact.

FOLLOW. ENGAGE. STAY INFORMED.

Join the global community committed to professional solar cleaning.



— SAFER WORKPLACES. HIGHER STANDARDS. A STRONGER SOLAR FUTURE. —