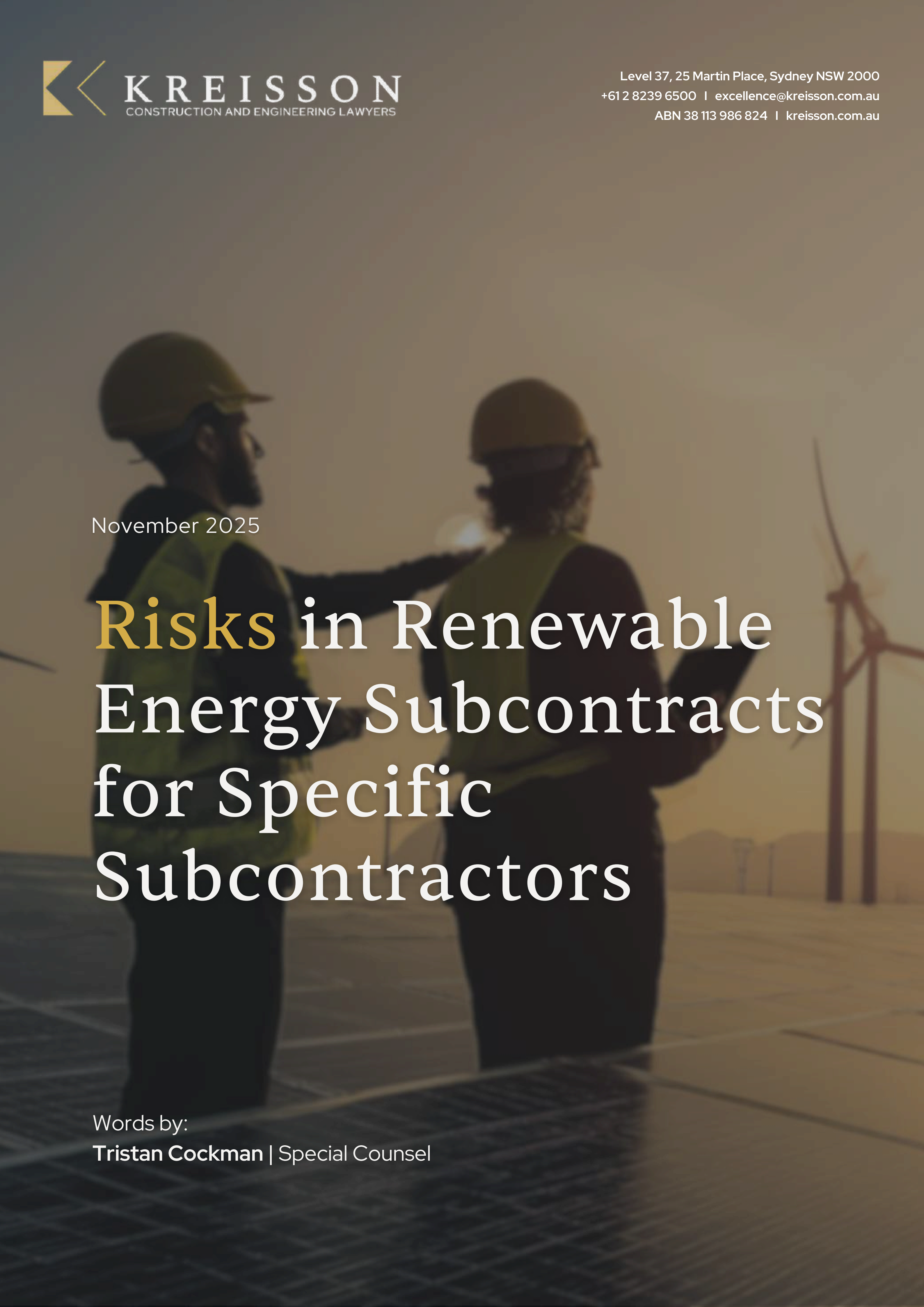

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Risks in Renewable Energy Subcontracts for Specific Subcontractors

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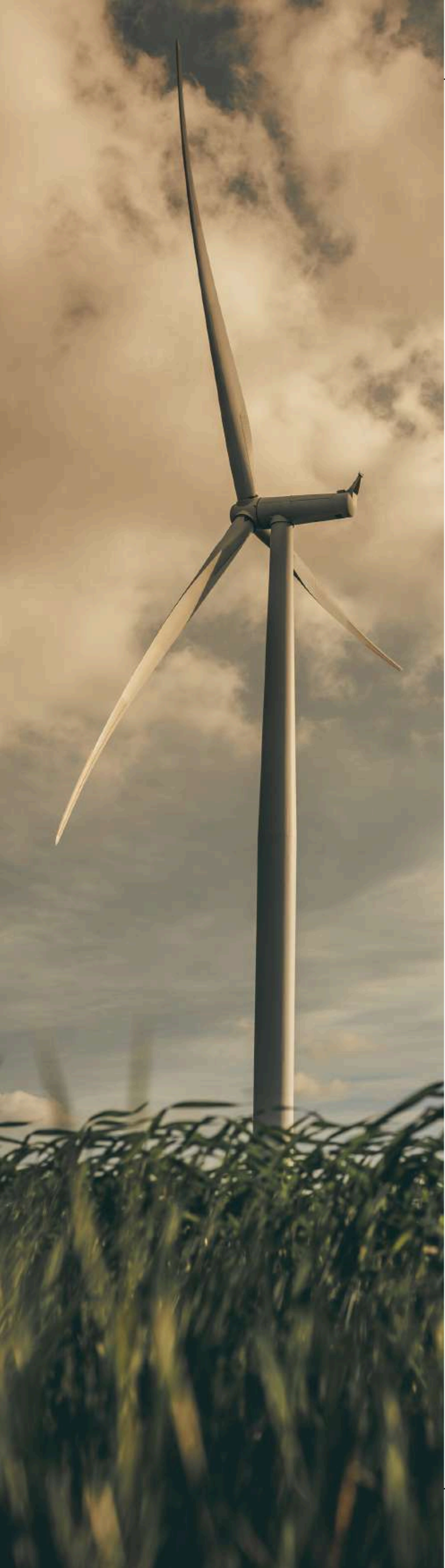
PREFACE

We have written this guide for subcontractors working in the renewable energy sector, whether already active in solar, wind or battery energy storage projects or considering entering this dynamic and rapidly evolving market. As Australia and the global energy industry transition toward net-zero targets, subcontractors are increasingly called upon to deliver critical scopes under complex contracting models and high-performance expectations.

Yet, despite their central role in project delivery, subcontractors often face disproportionate risk exposure. This guide bridges the gap between legal theory and site reality by providing a practical, technology-inclusive overview of how parties allocate risk across different subcontractor types. We designed this guide to help subcontractors understand the risks they may be asked to bear, how those risks arise and what subcontractors can do to manage or resist them.



INTRODUCTION

Renewable energy projects are complex undertakings involving multiple technologies, stakeholders and delivery models. Whether the project is a solar farm, wind farm or battery energy storage system (**BESS**), subcontractors are essential to its success. From civil earthworks to high-voltage commissioning, each subcontractor type contributes to the physical and operational integrity of the facility.

However, subcontractors often operate under significant commercial and legal pressure. Risks are frequently passed down from principals and Engineering, Procurement and Construction (**EPC**) contractors, sometimes without adequate consideration of who is best placed to manage them. These risks include design changes, program delays, interface failures, performance guarantees and regulatory compliance obligations.

Renewable energy projects are typically delivered under one of two contracting models. The first is the EPC 'full wrap' or 'turnkey' model where a single head contractor (known as the 'EPC contractor') is responsible for the entire project and subcontracts individual scopes. The second is the split contracting model where the principal engages multiple contractors directly for separate scopes. Each model contains distinct risk allocation and coordination challenges for subcontractors.

This guide examines risk allocation from the subcontractor's perspective. Each chapter focuses on a specific subcontractor type, exploring the risks they typically face and offering insights into how they can identify, negotiate and manage those risks.

Unless otherwise stated, references to "subcontractor" in this guide include both contractors and subcontractors engaged under either the split contracting or EPC model.

CHAPTER 1: CIVIL SUBCONTRACTORS

INTRODUCTION

Civil subcontractors play a foundational role in the delivery of utility-scale renewable energy projects, including solar farms, wind farms and BESS. Their responsibilities typically include site preparation, earthworks, access roads, drainage, fencing and structural foundations. These works form the physical backbone of the facility, enabling the installation and operation of generation and storage infrastructure.

While civil subcontractors are not responsible for the performance of the plant or its connection to the grid, they are nonetheless exposed to a range of risks that are often passed down through contracting arrangements. These risks vary depending on the delivery model, whether under an EPC contract or a split contracting structure and are influenced by the specific characteristics of the technology deployed.

These risks include site conditions, design interface, program and delay, quality and defects liability and safety and environmental compliance. Each renewable energy technology introduces unique challenges that civil subcontractors must understand and manage. Wind projects often involve complex logistics and heavy infrastructure, such as turbine foundations and crane pads, while BESS projects require precise thermal and structural tolerances and integration with fire safety systems.

Proactive risk identification, contract negotiation and coordination are essential to successful project delivery and long-term sustainability in the renewable energy sector.

CONTRACTING MODELS AND SCOPE DEFINITION

Under an EPC model, the principal engages an EPC contractor to deliver the entire project, including design, procurement, construction and commissioning. The EPC contractor then subcontracts portions of the work, including civil works, to specialist subcontractors. In this arrangement, the EPC contractor typically engages the civil subcontractor under a back-to-back subcontract, which mirrors the obligations and risks contained in the head EPC contract. The civil subcontractor may have limited visibility into the broader project context and limited ability to influence upstream decisions, such as design finalisation or program sequencing. Nonetheless, the EPC contractor expects them to deliver their scope in accordance with the EPC contractor's requirements and within the overall project timeline.

In contrast, under a split contracting model, the principal engages multiple subcontractors directly, often separating civil, electrical and supply scopes. This approach can offer greater flexibility and cost control, but it also introduces additional complexity in coordination and interface management. Civil subcontractors in split contracting arrangements may have more direct engagement with the principal and greater visibility into project planning, but they also bear increased responsibility for managing interactions with other subcontractors. The absence of a single point of responsibility means that civil subcontractors must be proactive in identifying and managing risks that arise from overlapping scopes and dependencies.

These risks are magnified in wind and BESS projects, where the number of stakeholders and technical interfaces is often greater. Wind projects typically involve coordination with turbine suppliers and transport logistics teams, while BESS projects require integration with electrical and fire safety systems. Hybrid contracting models such as engineering, procurement, construction and management (**EPCM**) are increasingly used in these contexts, further decentralising responsibility and increasing the need for robust interface management.

SITE CONDITIONS AND DESIGN CHANGE RISK

Site conditions are a critical risk factor for civil subcontractors across all renewable energy technologies. Civil works are inherently sensitive to the physical characteristics of the site, including soil composition, groundwater levels, topography and contamination. Despite this, civil subcontractors are often required to accept site conditions as-is, with limited recourse for unforeseen ground conditions. Contracts may include clauses that exclude claims for latent conditions or require the subcontractor to undertake lump sum pricing based on limited geotechnical data.

Design changes are frequently required during construction due to evolving geotechnical findings. For example, engineers may need to adjust pile design if ground conditions render the original design unviable. These changes can affect the layout of the facility, access roads and drainage systems, leading to rework and delays.

In wind projects, civil subcontractors are often responsible for constructing turbine foundations, crane pads and access tracks. These works are highly sensitive to ground conditions and design changes are common due to soil variability. Engineers may need to alter turbine base designs if soil strength is lower than expected and access tracks may require reinforcement to support heavy transport loads. There may also be additional requirements such as turning circles for blade delivery vehicles and the removal and reinstatement of stock grids or fencing to facilitate access, particularly in rural or agricultural settings.

In BESS projects, civil works are typically more compact but must meet strict thermal and structural tolerances. Site conditions such as drainage and heat dissipation become critical, especially for containerised systems. Poor drainage or inadequate thermal design can compromise fire safety and system performance.

To manage these risks, civil subcontractors should seek access to detailed geotechnical surveys and soil reports during the tender phase and negotiate for provisional sums or latent condition clauses that allow for adjustment in the event of unforeseen conditions. Where such clauses are not available, subcontractors must carefully assess the adequacy of the site information provided and consider including contingencies in their pricing to account for potential variability.

DESIGN INTERFACE RISK

Civil works must align precisely with the electrical and structural designs of the facility. Misalignment can result in rework, delays and disputes over responsibility. This risk is particularly acute in split contracting models, where multiple parties may issue design information and coordination is less centralised.

Wind projects introduce more complex interface risks due to the involvement of original equipment manufacturers (**OEMs**) for turbine supply and installation. Civil subcontractors may be required to coordinate with turbine suppliers to ensure foundations and access tracks meet precise specifications. Delays in turbine delivery or changes in turbine layout can disrupt civil works.

In BESS projects, interface risks often relate to electrical integration and fire safety systems. Civil subcontractors may need to coordinate with electrical and fire protection teams to ensure compliance with safety codes and thermal management requirements.

Civil subcontractors should seek early access to issued-for-construction drawings and participate in design reviews to ensure that their scope is properly integrated with other disciplines. They should also clarify scope boundaries in their contracts, particularly where trenching or conduit installation overlaps with electrical works. Poor coordination at the design stage often causes costly rework and schedule disruption, especially if civil works are completed before electrical designs are finalised.

PROGRAM AND DELAY RISK

Program and delay risk is a major concern for civil subcontractors. Renewable energy projects are often delivered under tight timelines, driven by regulatory milestones, financing conditions or grid connection windows. Civil subcontractors may be required to complete their works within a fixed period, even when other parties cause delays, such as late design issuance, access constraints or supply chain disruptions. Contracts may include liquidated damages for delay, with limited entitlement to extensions of time.

Wind projects are often located in remote areas with limited infrastructure, increasing the risk of access delays, weather disruption and labour shortages. Transporting large components like blades and nacelles (the top sections of wind turbines that contains the gearbox, generator and control systems) requires upgraded roads and precise logistics coordination, which can affect civil works.

BESS projects may be less affected by transport logistics but are often tied to broader grid upgrade programs. Delays in grid readiness or commissioning can stall civil completion and handover.

To mitigate these risks, civil subcontractors should negotiate realistic programs with appropriate float and ensure that their contracts include provisions for extensions of time in the event of delays caused by others. They should also maintain detailed records of dependencies and notify the principal promptly when delays occur. In split contracting models, where coordination is more complex, the risk of delay due to interface failures is heightened and civil subcontractors must be especially vigilant in managing their program obligations.

QUALITY AND DEFECTS LIABILITY

Civil subcontractors are responsible for meeting specified standards, such as compaction levels, concrete strength and drainage performance. These standards are typically defined in the project specifications and are subject to inspection and testing. Contracts usually subject civil subcontractors to a defects liability period, during which they are required to rectify any defects in their work. This can include latent defects that become apparent after completion or serial defects affecting multiple components.

In wind projects, defects in turbine foundations or crane pads can have serious implications for structural integrity and safety. In BESS projects, defects in drainage or containment structures may affect fire safety and thermal performance.

The cost of rectification can be significant, particularly if access to the site is restricted or if rework affects other disciplines. Civil subcontractors should maintain robust quality assurance and quality control documentation to demonstrate compliance with specifications and to defend against claims. They should also clarify the scope and duration of their defects liability obligations and ensure that any exclusions or limitations are clearly documented.

SAFETY AND ESG COMPLIANCE

Civil subcontractors are typically responsible for site safety and environmental compliance. This includes implementing erosion control measures, managing dust suppression, maintaining safe access routes and complying with environmental permits and management plans. Failure to comply with these obligations can result in regulatory penalties, stop-work orders or reputational damage.

Wind projects face heightened community and environmental scrutiny, especially regarding noise, visual impact and land use. Project requirements may require civil subcontractors to implement dust suppression, erosion control and noise mitigation measures during construction.

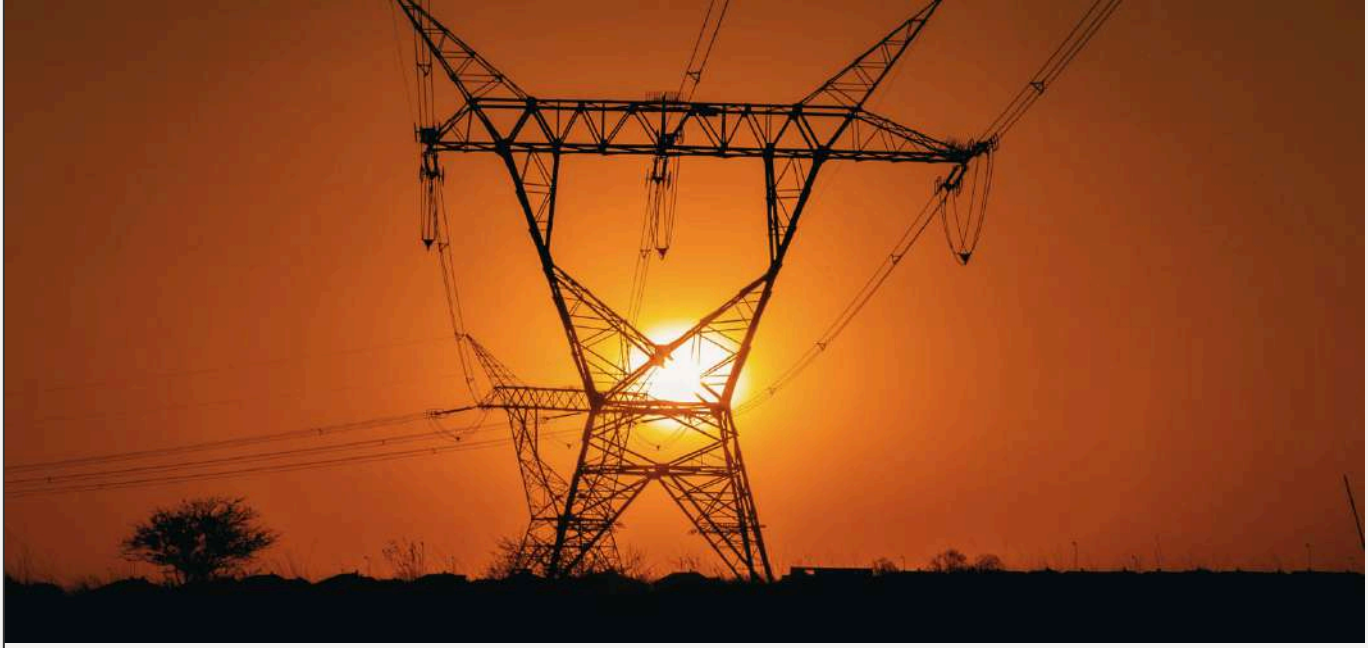
BESS projects raise environmental, social and governance (**ESG**) concerns around battery sourcing, fire risk and hazardous materials. Civil subcontractors may be involved in containment and fire barrier construction, which must comply with evolving safety standards.

In recent years, ESG compliance has become increasingly important. Civil subcontractors may be required to adhere to cultural heritage protections, labour standards and environmental impact controls. Legislation in some jurisdictions mandates active monitoring of supply chains to prevent human rights abuses and environmental harm. Non-compliance can lead to fines, reputational damage and even litigation.

Civil subcontractors should review the project's environmental management plans and ensure that their teams are trained and equipped to implement the required measures. They should also budget for compliance activities and maintain records to demonstrate adherence to regulatory requirements.

CONCLUSION

Civil subcontractors face a distinct set of risks in renewable energy projects, shaped by the contracting model and the nature of their scope. These risks include site conditions, design interface, program and delay, quality and defects liability and safety and environmental compliance. While many of these risks are common across solar, wind and BESS projects, each technology introduces unique challenges that civil subcontractors must understand and manage. Proactive risk identification, contract negotiation and coordination are essential to successful project delivery and long-term sustainability in the renewable energy sector.



CHAPTER 2: ELECTRICAL SUBCONTRACTORS

INTRODUCTION

Electrical subcontractors play a critical role in the delivery of renewable energy projects, including solar farms, wind farms and BESS. Their scope typically covers electrical installation, cabling, terminations, switchgear, transformers, inverters, grid interface equipment and testing and commissioning. In BESS projects, this may also extend to integration of control systems, fire protection and auxiliary power.

Electrical subcontractors are often engaged under EPC contracts or directly by the principal in split contracting models. In either case, they are exposed to a distinct set of risks, related to performance, grid compliance and coordination with other disciplines. These risks are shaped by the contracting structure, the complexity of the technology and the regulatory environment in which the project is delivered.

Unlike civil subcontractors, electrical subcontractors must ensure that their installations meet specified performance guarantees and grid connection obligations and that testing protocols are clearly defined. Their work is directly tied to the operational success of the facility and failures in electrical scope can result in liquidated damages, termination or loss of revenue.

CONTRACTING MODELS AND SCOPE DEFINITION

Under an EPC model, the electrical subcontractor may be a subcontractor to the EPC contractor, delivering works under a back-to-back arrangement. This structure can limit visibility into upstream risks and reduce flexibility in managing interfaces. However, it also provides a single point of responsibility for the principal, which may simplify coordination.

In split contracting models, the principal often engages the electrical subcontractor directly. Engagement under split contracting increases visibility and control but heightens interface risk, particularly with civil subcontractors, equipment suppliers and grid operators. Electrical subcontractors must manage dependencies across multiple parties and ensure that their scope is clearly defined and coordinated.

In wind projects, electrical subcontractors may be responsible for internal cabling between turbines, substation works and grid interface equipment. In BESS projects, they may be required to install and commission complex control systems, integrate with Supervisory Control and Data Acquisition (**SCADA**) platforms and ensure compliance with fire safety and energy management protocols.

GRID CONNECTION AND COMPLIANCE RISK

Grid connection is one of the most significant risks faced by electrical subcontractors. Delays in achieving grid compliance can result in liquidated damages, loss of revenue and reputational harm. Electrical subcontractors are often responsible for delivering works that meet the requirements of the connection agreement, including generator performance standards, reactive power support and SCADA integration.

In Australia, grid connection risk is heightened by regulatory complexity and evolving technical standards. The Australian Energy Market Operator (**AEMO**) and network service providers (**NSPs**) impose detailed requirements for model validation, hold point testing and commissioning. These requirements are subject to interpretation and may change during the project lifecycle.

Electrical subcontractors must ensure that their designs and installations comply with the latest grid codes and connection requirements. This includes managing risks associated with harmonic filtering, transformer impedance, fault level compliance and reactive power obligations. In wind projects, this may involve coordination with turbine OEMs to ensure that electrical systems are compatible with turbine control logic. In BESS projects, it may require integration with grid-forming inverters and energy management systems.

To manage grid risk, electrical subcontractors should seek clarity in the connection agreement and ensure that their scope is aligned with the obligations of the principal. They should also engage early with grid operators, participate in model validation processes and maintain flexibility to adapt to changing requirements.

PERFORMANCE GUARANTEES AND LIQUIDATED DAMAGES

Electrical subcontractors are often responsible for delivering performance guarantees, particularly in EPC contracts. These guarantees may relate to energy output, system efficiency, availability or reactive power capability. Failure to meet performance guarantees can result in performance liquidated damages, which are typically calculated based on lost revenue or reduced system value.

In solar projects, performance guarantee as may be tied to inverter output, system losses or energy yield. In wind projects, they may relate to turbine availability (see also Chapter 6 relating to the supply of specialist equipment), internal losses or substation efficiency. In BESS projects, guarantees may include round-trip efficiency, response time and capacity retention.

Electrical subcontractors must ensure that their installations meet the specified performance criteria and that testing protocols are clearly defined. This includes factory acceptance testing, site commissioning and performance verification. Where performance is affected by third-party equipment or grid conditions, subcontractors should seek appropriate carve-outs or relief mechanisms.

Liquidated damages for delay may also apply if electrical works are not completed on time. These damages may be capped but can be substantial, particularly where grid connection or commercial operation is delayed. Electrical subcontractors should ensure that delay risk is appropriately allocated and that extension of time provisions are enforceable.

INTERFACE AND COORDINATION RISK

Electrical subcontractors must coordinate closely with civil subcontractors, equipment suppliers and grid operators. Interface failures can result in rework, delay and disputes. Common issues include misalignment of trenching and conduit routes, late delivery of equipment and incompatible control systems.

In split contracting models, the risk of interface failure is higher. Electrical subcontractors may be dependent on civil subcontractors for trenching, foundations and access and on suppliers for timely delivery of switchgear, transformers and inverters. Coordination with SCADA integrators and fire protection teams is also critical, particularly in BESS projects.

In wind projects, electrical subcontractors may face interface risks related to turbine cabling, earthing systems and substation integration. In BESS projects, coordination with heating, ventilation and air conditioning (**HVAC**), fire suppression and control system providers is essential to ensure safe and compliant operation.

To manage interface risk, electrical subcontractors should participate in design coordination meetings, maintain detailed interface schedules and document dependencies. They should also ensure that their contracts include provisions for delay or disruption caused by other parties.

SAFETY, ENVIRONMENTAL AND REGULATORY COMPLIANCE

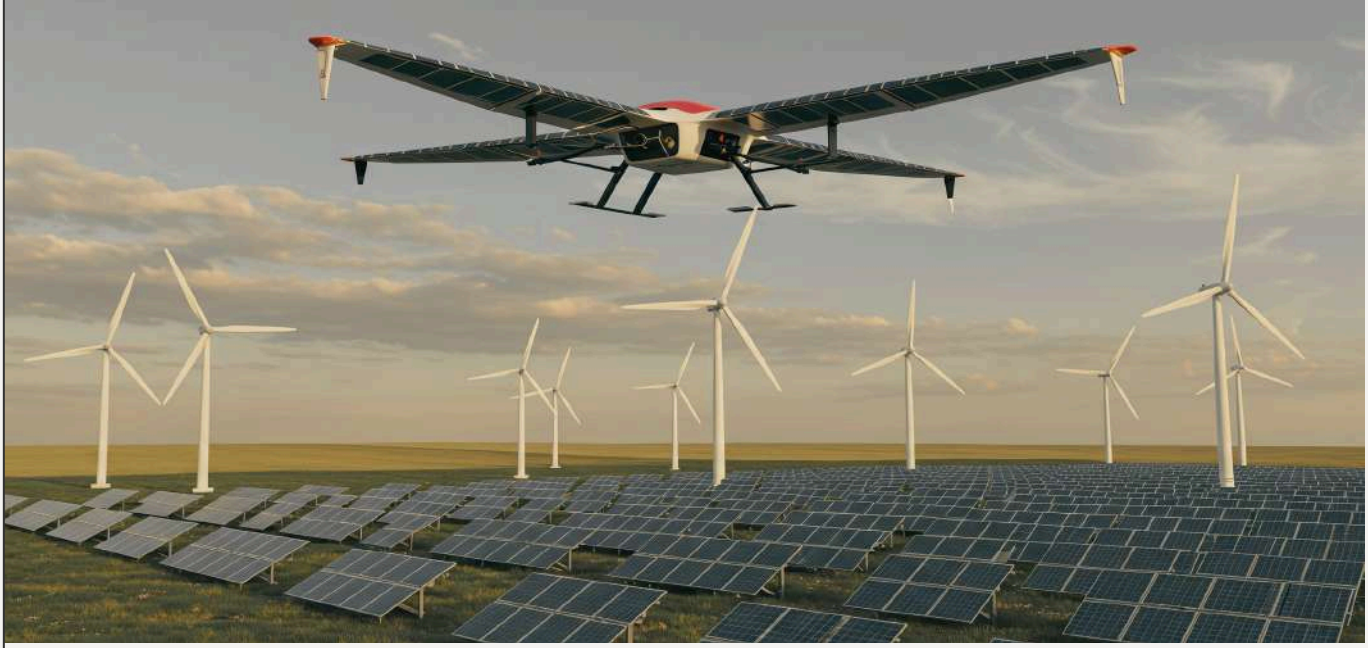
Electrical subcontractors are subject to stringent safety and regulatory requirements. This includes compliance with electrical safety codes, environmental permits and fire protection standards. In BESS projects, fire safety is a major concern and subcontractors may be required to install containment systems, fire-rated cabling and emergency shutdown protocols.

Environmental compliance may include noise limits, electromagnetic interference and hazardous materials handling. In wind projects, electrical subcontractors may be required to manage noise emissions from substations and transformers and to ensure compliance with landowner agreements.

Electrical subcontractors should ensure that their teams are trained in relevant safety standards and that installations are inspected and certified. In BESS projects, this may include coordination with fire authorities and compliance with battery safety standards. In wind projects, it may involve managing community concerns and ensuring that electrical infrastructure does not interfere with agricultural operations.

CONCLUSION

Electrical subcontractors face a distinct set of risks in renewable energy projects, shaped by the contracting model, technology type and regulatory environment. These risks include grid connection and compliance, performance guarantees, liquidated damages, interface coordination and safety and environmental compliance. While many of these risks are common across solar, wind and BESS projects, each technology introduces unique challenges that electrical subcontractors must understand and manage. Proactive engagement, clear scope definition and robust contract negotiation are essential to successful delivery and long-term project viability.



CHAPTER 3: MECHANICAL SUBCONTRACTORS

INTRODUCTION

Mechanical subcontractors play a vital role in the construction and commissioning of renewable energy projects, including solar farms, wind farms and BESS. Their scope typically includes mechanical installation of plant and equipment, structural steelwork, mounting systems, HVAC, piping, fluid handling systems and mechanical integration with electrical and civil works. In BESS projects, mechanical subcontractors may also be responsible for thermal management systems, fire suppression infrastructure and containerised system assembly.

Although mechanical subcontractors are not usually responsible for grid connection or energy performance, their work is essential to the safe, reliable and compliant operation of the facility. Poor mechanical execution can lead to delays, defects and safety risks and in some cases, may affect commissioning and handover milestones. The risks faced by mechanical subcontractors vary depending on the contracting model, the complexity of the technology and the interfaces with other disciplines.

CONTRACTING MODELS AND SCOPE DEFINITION

Mechanical subcontractors may be engaged under EPC contracts as subcontractors or directly by the principal in split contracting arrangements. In EPC models, their scope is typically defined and managed by the EPC contractor, with limited visibility into upstream risks. In split contracting models, mechanical subcontractors may have more direct engagement with the principal and other subcontractors but also bear greater responsibility for coordination and interface management.

In solar projects, mechanical scope often includes installation of mounting structures, trackers and racking systems. In wind projects, it may include mechanical assembly of turbine components, nacelle installation support and crane pad preparation. In BESS projects, mechanical subcontractors are frequently responsible for HVAC systems, fire suppression piping and mechanical integration of battery containers or enclosures.

Clear scope definition is critical, particularly where mechanical works interface with electrical and civil disciplines. Misalignment in design or sequencing can lead to rework, delay and disputes. Mechanical subcontractors should ensure that their scope is well-defined, coordinated with other packages and supported by accurate design documentation.

DESIGN AND SPECIFICATION RISK

Mechanical subcontractors are often required to deliver works in accordance with detailed design specifications. These may be provided by the principal, the EPC contractor or a design consultant. In some cases, mechanical subcontractors may be responsible for design development or shop drawing preparation, particularly for mounting systems, HVAC layouts or fire suppression networks.

Design risk arises where specifications are incomplete, inconsistent or subject to change. In solar projects, tracker systems may require adjustment due to terrain or geotechnical constraints. In wind projects, turbine OEMs may impose specific mechanical tolerances or installation procedures that affect foundation or assembly works. In BESS projects, fire suppression and thermal management systems must comply with evolving safety standards and may require coordination with multiple stakeholders.

Mechanical subcontractors should ensure that design information is complete and coordinated before commencing works. Where design development is part of their scope, they should seek appropriate review and approval mechanisms and ensure that liability for design errors is clearly allocated. They should also monitor for changes in specification and seek variation entitlements where applicable.

INTERFACE AND COORDINATION RISK

Mechanical works often overlap with civil and electrical scopes, creating significant interface risk. In solar projects, mounting systems must align with civil foundations and electrical conduit routes. In wind projects, mechanical assembly of turbines must be coordinated with crane operations, electrical terminations and OEM supervision. In BESS projects, HVAC and fire suppression systems must be integrated with electrical control systems and container layouts.

Interface failures can result in rework, delay and safety issues. Mechanical subcontractors may be dependent on other subcontractors for access, sequencing and information. In split contracting models, the absence of a single point of coordination increases the risk of misalignment.

To manage interface risk, mechanical subcontractors should participate in coordination meetings, maintain detailed interface schedules and document dependencies. They should also ensure that their contracts include provisions for delay or disruption caused by other parties and that interface responsibilities are clearly defined.

PROGRAM AND DELAY RISK

Mechanical works are often scheduled late in the construction program, making them vulnerable to upstream delays. Late completion of civil works, delayed equipment delivery or design changes can compress the mechanical installation window and increase the risk of delay. In some cases, mechanical subcontractors may be required to accelerate works or re-sequence tasks to meet commissioning deadlines.

In wind projects, mechanical installation of turbines is highly dependent on crane availability, weather conditions and OEM supervision. In BESS projects, mechanical installation may be delayed by late delivery of containers or changes in fire safety requirements. In solar projects, tracker installation may be affected by terrain adjustments or electrical trenching delays.

Mechanical subcontractors should ensure that their programs are realistic and include float for upstream dependencies. They should also maintain records of delay causes and seek extensions of time where appropriate. Where liquidated damages apply, they should ensure that delay risk is appropriately capped and that relief mechanisms are enforceable.

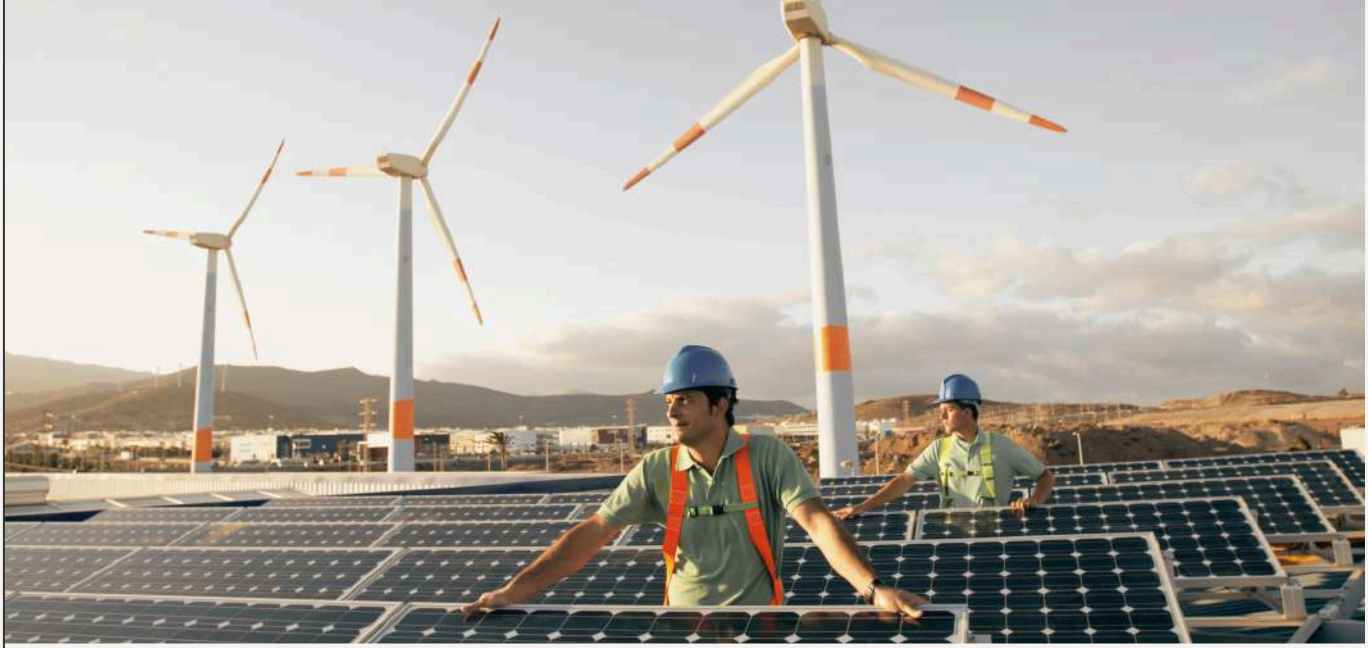
QUALITY, SAFETY AND COMPLIANCE RISK

Mechanical subcontractors are responsible for delivering works that meet specified quality standards and comply with safety and regulatory requirements. This includes structural integrity, mechanical tolerances, fire safety compliance and environmental controls. In BESS projects, fire suppression systems must meet stringent standards and may require coordination with fire authorities. In wind projects, mechanical assembly must comply with OEM procedures and may be subject to inspection and certification.

Defects in mechanical works can have serious consequences, including safety incidents, commissioning delays and reputational damage. Mechanical subcontractors should maintain robust quality assurance and quality control processes and ensure that inspections and testing are documented. They should also ensure that their teams are trained in relevant safety standards and that works are delivered in accordance with applicable codes and permits.

CONCLUSION

Mechanical subcontractors face a distinct set of risks in renewable energy projects, shaped by the contracting model, technology type and interface complexity. These risks include design and specification risk, interface coordination, program delay and quality and compliance obligations. While mechanical scope may vary across solar, wind and BESS projects, the underlying commercial and delivery risks are consistent. Successful project execution requires clear scope definition, proactive coordination and robust contract management to ensure that mechanical works are delivered safely on time and in accordance with specification.



CHAPTER 4:
SOLAR PANEL INSTALLATION SUBCONTRACTORS

INTRODUCTION

Solar panel installation subcontractors for utility-scale solar projects (**installers**) are responsible for the physical installation of the solar panels. Their scope typically includes mounting panels onto racking systems or trackers, securing the panels to frames, connecting the panels with the electrical wiring and assisting with pre-commissioning activities.

While their role may appear straightforward compared to other subcontractors, installers operate within a complex contractual and delivery environment that exposes them to a range of risks.

Installers may be engaged directly by the principal, by the EPC contractor or by a subcontractor responsible for broader mechanical or electrical works. Their work is highly dependent on the sequencing and quality of upstream civil and mechanical works and they are often required to work under tight timelines and in challenging site conditions. Although they are not responsible for system performance or grid connection, their work directly affects the integrity, safety and long-term reliability of the solar array.

CONTRACTING MODELS AND SCOPE DEFINITION

Installers are typically engaged under subcontract arrangements, either as part of a mechanical package or as a standalone scope. In EPC contracts, they may be several tiers removed from the principal, with limited visibility into upstream risks and obligations. In split contracting models, they may be engaged directly or through a nominated subcontractor, depending on how the principal chooses to manage the installation phase.

Clear scope definition is essential. Installers must understand whether their responsibilities include unpacking and handling the panels, managing logistics and laydown areas, connecting the electrical wiring and assisting with testing. Misunderstandings around scope can lead to disputes, delays and cost overruns. Installers should ensure that their scope is clearly documented and coordinated with other subcontractors, particularly mechanical and electrical subcontractors.

SITE CONDITIONS AND ACCESS RISK

Solar panel installation is highly sensitive to site conditions. Uneven terrain, poor drainage and incomplete civil works can delay installation or compromise quality. Installers may be required to work on sloped or unstable ground, in high temperatures or under time pressure due to weather constraints or program compression.

Access risk is also significant. Installers rely on completed access roads, laydown areas and safe working platforms. If civil works are delayed or poorly executed, installation may be disrupted. In some cases, installers may be required to work around other subcontractors or in partially completed zones, increasing the risk of damage or injury.

To manage these risks, installers should conduct pre-start inspections, raise access concerns early and ensure that their contracts include provisions for delay or disruption caused by others. They should also ensure that site safety plans are in place and that their teams are trained to work in challenging environments.

INTERFACE AND COORDINATION RISK

Solar panel installation is a highly sequenced activity that depends on the timely completion of mechanical and civil works. Installers must coordinate with racking or tracker suppliers, electrical and mechanical subcontractors to ensure that mounting systems are ready, cabling routes are clear and installation can proceed without interruption.

Interface failures can result in rework, idle time and disputes. For example, if tracker installation is delayed or misaligned, panel installation may be postponed. If electrical wiring is not coordinated with panel layout, connections may need to be redone. In large projects, multiple installation teams may be working simultaneously, increasing the need for clear sequencing and communication.

Installers should participate in coordination meetings, maintain daily progress logs and communicate proactively with other subcontractors. Their contracts should include provisions for delay caused by upstream works and clearly define responsibilities for interface management.

QUALITY AND DEFECTS RISK

The quality of panel installation directly affects system performance, safety and long-term reliability. Poor installation practices, such as over-tightening clamps, misalignment or improper cable management, can lead to panel damage, electrical faults or reduced energy yield. Installers may be held liable for defects discovered during commissioning or within the defects liability period.

Quality risk is heightened by the repetitive nature of installation and the use of large workforces, often including subcontracted labour. Maintaining consistent standards across thousands of panels requires robust supervision, training and quality assurance processes.

Installers should ensure that their teams are trained in manufacturer guidelines, that installation procedures are documented and that quality checks are conducted regularly. They should also clarify the scope and duration of their defects liability obligations and ensure that any exclusions or limitations are clearly documented.

SAFETY AND COMPLIANCE RISK

Solar panel installation involves working at height, manual handling and exposure to electrical components. Safety risks include falls, heat stress, lifting injuries and electrical hazards. Installers must comply with site safety plans, national safety codes and any project-specific requirements.

Compliance risk also includes environmental obligations, such as dust suppression, waste management and protection of sensitive areas. In some jurisdictions, cultural heritage protections may apply, requiring installers to avoid certain zones or follow specific protocols. Installers should be aware of any environmental or heritage obligations that may apply to the site and ensure that these are clearly defined and appropriately allocated in the contract. Where such obligations exist, they should be limited to what is reasonably within the installer's control.

Installers should ensure that their teams are inducted into site safety procedures, that personal protective equipment is used appropriately and that incidents are reported and managed in accordance with site protocols.

PROGRAM AND PRODUCTIVITY RISK

Solar panel installation is often scheduled late in the construction program, making it vulnerable to upstream delays. If civil or mechanical works are delayed, installation may be compressed into a shorter window, increasing pressure on productivity and quality. Installers may be required to accelerate works, work extended hours or re-sequence tasks to meet commissioning deadlines.

Productivity risk is also affected by weather, labour availability and logistics. High temperatures, wind or rain can slow installation or create safety risks. Labour shortages or transport delays can disrupt progress. In large projects, maintaining consistent productivity across multiple zones requires careful planning and supervision.

Installers should ensure that their programs are realistic, that productivity targets are achievable and that their contracts include provisions for delay and acceleration. They should also maintain daily progress records and communicate proactively with the principal or EPC contractor.

CONCLUSION

Installers play a critical role in the successful delivery of utility-scale solar projects. While their scope may appear narrow, they operate within a complex delivery environment that exposes them to significant commercial, safety and coordination risks. These risks include site access, interface management, quality assurance, safety compliance and program pressure. Successful installation requires clear scope definition, proactive coordination and robust supervision to ensure that panels are installed safely, efficiently and to specification.

CHAPTER 5: SUBSTATION AND HIGH-VOLTAGE SUBCONTRACTORS

INTRODUCTION

Substation and high-voltage subcontractors (**HV subcontractors**) are responsible for the delivery of critical infrastructure that enables renewable energy projects to connect to the grid and operate safely and reliably. Their scope typically includes the design, supply, installation and commissioning of high-voltage equipment such as transformers, switchgear, protection systems, control panels and SCADA integration. In many cases, they are also responsible for grid interface works, including compliance with generator performance standards and coordination with NSPs.

These HV subcontractors operate in a highly regulated and technically demanding environment. Their work is central to the bankability and operational success of solar farms, wind farms and BESS. Failures in scope can result in grid connection delays, liquidated damages and long-term performance issues. The risks they face are shaped by the contracting model, the complexity of the grid interface and the evolving regulatory landscape.

CONTRACTING MODELS AND SCOPE DEFINITION

HV subcontractors may be engaged directly by the principal, by the EPC contractor or through specialist design-and-construct packages. In EPC models, they are often subcontracted under back-to-back terms, with limited visibility into upstream obligations. In split contracting models, they may be engaged directly, particularly where the principal wishes to retain control over grid connection or manage key supplier relationships.

Their scope must be clearly defined, particularly in relation to grid compliance, equipment supply and interface responsibilities. Ambiguities around who is responsible for grid modelling, hold point testing or SCADA integration can lead to disputes and delays. HV subcontractors should ensure that their scope is aligned with the connection agreement and that any obligations imposed by the NSP or AEMO are clearly allocated.

In BESS projects, HV subcontractors may also be responsible for integrating battery systems with substations, including transformer sizing, protection coordination and export control. In wind projects, they may manage internal cabling between turbines and substations, as well as reactive power support and fault level compliance.

GRID CONNECTION AND COMPLIANCE RISK

Grid connection is the most significant risk faced by HV subcontractors. They are often responsible for delivering works that enable the project to meet its connection obligations, including generator performance standards, reactive power capability, fault ride-through and SCADA integration. Delays or failures in grid compliance can result in liquidated damages, loss of revenue and reputational harm.

In Australia, grid connection risk is heightened by the complexity of AEMO and NSP requirements. These include model validation, interim hold point testing, commissioning protocols and compliance with evolving technical standards. HV subcontractors may be required to coordinate with multiple stakeholders, including OEMs, electrical subcontractors and grid operators, to ensure that the facility is ready for energisation and export.

To manage this risk, HV subcontractors should engage early with grid operators, participate in connection modelling and ensure that their designs and installations comply with the latest standards. They should also ensure that their contracts include provisions for relief in the event of regulatory changes or delays caused by third parties.

DESIGN AND SPECIFICATION RISK

High-voltage works are highly design sensitive. Equipment specifications must align with grid requirements, project performance targets and site conditions. Errors or omissions in design can lead to non-compliance, rework or equipment failure. In some cases, HV subcontractors may be responsible for detailed design, while in others they may be required to deliver works based on principal-supplied specifications.

Design risk is particularly acute where multiple technologies are integrated, such as solar and BESS. Transformer sizing, protection coordination and harmonic filtering must be carefully managed to avoid system instability or grid rejection.

HV subcontractors should ensure that design responsibilities are clearly defined and that any reliance on third-party designs is supported by appropriate warranties or indemnities. They should also ensure that equipment specifications are validated against grid requirements and that any changes are documented and approved.

INTERFACE AND COORDINATION RISK

High-voltage works interface with civil, electrical and control systems. Coordination failures can result in misalignment, delay and safety risks. Common issues include late delivery of civil foundations, incompatible cable terminations and SCADA integration failures.

In split contracting models, HV subcontractors may be required to coordinate with multiple parties, including civil subcontractors for trenching and foundations, electrical subcontractors for cabling and terminations and SCADA integrators for control system commissioning. In BESS projects, coordination with battery suppliers and fire safety teams is also critical.

To manage interface risk, HV subcontractors should participate in coordination meetings, maintain interface schedules and document dependencies. Their contracts should include provisions for delay or disruption caused by other parties and clearly define interface responsibilities.

PROGRAM AND DELAY RISK

High-voltage works are often scheduled late in the construction program, making them vulnerable to upstream delays. Late completion of civil works, delayed equipment delivery or design changes can compress the installation window and increase the risk of delay. In some cases, HV subcontractors may be required to accelerate works or re-sequence tasks to meet energisation deadlines.

Program risk is compounded by long lead times for equipment, particularly transformers and switchgear. Global supply chain disruptions, regulatory approvals and testing protocols can further delay delivery and commissioning.

HV subcontractors should ensure that their programs are realistic, that procurement schedules are aligned with site readiness and that their contracts include provisions for extensions of time and relief from liquidated damages where delays are caused by others.

SAFETY, QUALITY AND REGULATORY COMPLIANCE

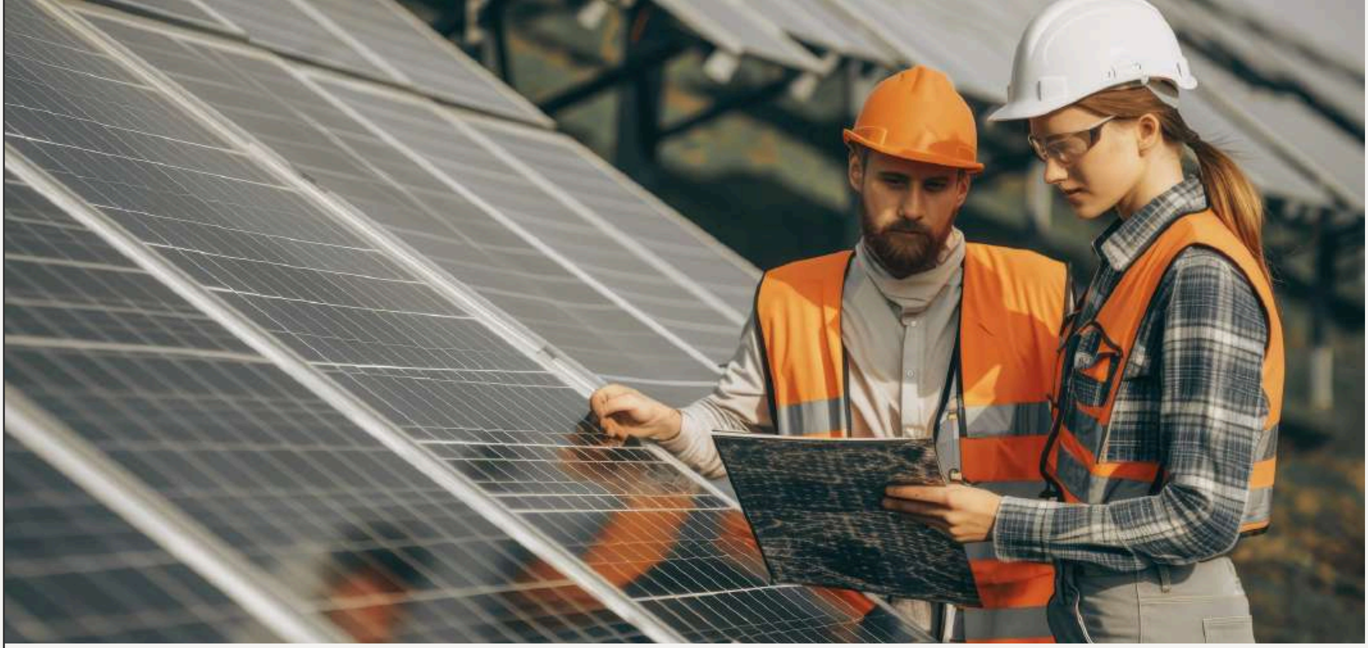
High-voltage works are subject to stringent safety and regulatory requirements. This includes compliance with electrical safety codes, environmental permits and grid operator protocols. Safety risks include arc flash, high-voltage isolation and energisation procedures. Quality risks include equipment failure, protection miscoordination and SCADA integration errors.

HV subcontractors must ensure that their teams are trained in safety procedures, that installations are inspected and tested and that commissioning is conducted in accordance with grid operator requirements. They should also ensure that documentation is complete and that compliance records are maintained.

In BESS projects, HV subcontractors may also be responsible for integrating battery systems with substations, requiring coordination with fire safety standards and energy management protocols. In wind projects, they may manage reactive power support and fault level compliance, requiring coordination with turbine OEMs and grid operators.

CONCLUSION

HV subcontractors play a critical role in the successful delivery of renewable energy projects. Their work enables grid connection, ensures compliance with technical standards and supports safe and reliable operation. The risks they face include grid compliance, design and specification, interface coordination, program delay and safety and regulatory obligations. These risks are heightened by the complexity of modern renewable energy projects and the evolving regulatory landscape. Successful delivery requires early engagement, clear scope definition and robust contract management to ensure that HV works are delivered safely on time and to specification.



CHAPTER 6: SPECIALIST SUPPLIER SUBCONTRACTORS

INTRODUCTION

Specialist supplier subcontractors (**suppliers**) play a pivotal role in the delivery of renewable energy projects, particularly where proprietary equipment is central to performance, safety and grid compliance. Suppliers typically provide batteries, inverters, transformers, switchgear, control systems and other high-value components that are essential to the operation of solar farms, wind farms and BESS.

Unlike other subcontractor types, suppliers may not be involved in on-site construction or installation. However, their products are often subject to performance guarantees, warranty obligations and integration requirements that carry significant commercial and technical risk. Their engagement may be structured through direct supply agreements with the principal, free-issue arrangements to EPC contractors or subcontracting via nominated vendors.

The risks associated with specialist supply are shaped by procurement strategy, delivery timelines, interface complexity and the evolving regulatory and technology landscape. Managing these risks effectively is critical to ensuring project bankability, grid compliance and long-term asset performance.

CONTRACTING MODELS AND SUPPLY ARRANGEMENTS

Specialist suppliers may be engaged under standalone supply agreements, nominated subcontractor arrangements or as part of EPC packages. In some cases, the principal may procure key equipment directly and free issue it to the EPC or relevant installation subcontractor. This approach can reduce cost and improve control but also introduces interface and warranty risks.

In other cases, the EPC contractor may be responsible for procuring all equipment, including specialist components. This simplifies coordination but may reduce transparency and leverage in negotiating warranty terms or delivery schedules. Where nominated suppliers are used, tripartite agreements between the principal, EPC contractor and supplier are often required to manage risk and ensure continuity of obligations.

Supply agreements must clearly define scope, specifications, delivery terms, warranty obligations and integration requirements. They should also address intellectual property rights, testing protocols and liability for underperformance or delay.

PERFORMANCE AND WARRANTY RISK

Specialist equipment is often subject to performance guarantees and long-term warranties. Batteries may be required to meet round-trip efficiency, degradation limits and cycle life targets. Inverters may be subject to output, efficiency and grid compliance guarantees. Transformers and switchgear may carry reliability and fault tolerance obligations.

Failure to meet performance guarantees can result in liquidated damages, warranty claims or reduced asset value. In some cases, underperformance may affect the ability to achieve commercial operation or meet lender requirements. Suppliers must ensure that their products are tested, certified and supported by robust warranty documentation.

Warranty risk also includes the ability to enforce obligations over time. Long-term warranties must be backed by financially stable entities and include provisions for assignability, step-in rights and access to technical support. Where suppliers are overseas or subject to geopolitical risk, additional protections may be required.

DELIVERY AND PROCUREMENT RISK

Specialist equipment often has long lead times and is subject to global supply chain volatility. Delays in manufacturing, shipping, customs clearance or testing can disrupt project schedules and expose the principal or EPC contractor to liquidated damages.

Procurement risk is heightened by market conditions, commodity price fluctuations (including from foreign exchange rates) and regulatory changes. For example, battery supply may be affected by lithium availability, export restrictions or safety certification delays. Inverter supply may be constrained by semiconductor shortages or changes in grid compliance standards.

Contracts should include clear delivery schedules, delay remedies and provisions for force majeure or market disruption. Where price fluctuations are a concern, price adjustment mechanisms or hedging strategies may be appropriate. Suppliers should also ensure that packaging, transport and storage requirements are clearly defined to avoid damage or delay.

Given that most major components of renewable energy projects are sourced from overseas, suppliers should consider requiring principals or EPC contractors to provide financial security or payment guarantees to secure payments to suppliers in foreign jurisdictions.

INTERFACE AND INTEGRATION RISK

Specialist equipment must be integrated with civil, electrical and control systems. Interface failures can result in rework, commissioning delays or non-compliance. Common issues include incompatible control protocols, mismatched cable terminations or inadequate space planning.

In BESS projects, battery systems must be integrated with HVAC, fire suppression and SCADA platforms. In solar projects, inverters must align with electrical wiring, mounting systems and grid interface equipment. In wind projects, transformers and switchgear must coordinate with turbine output and substation design.

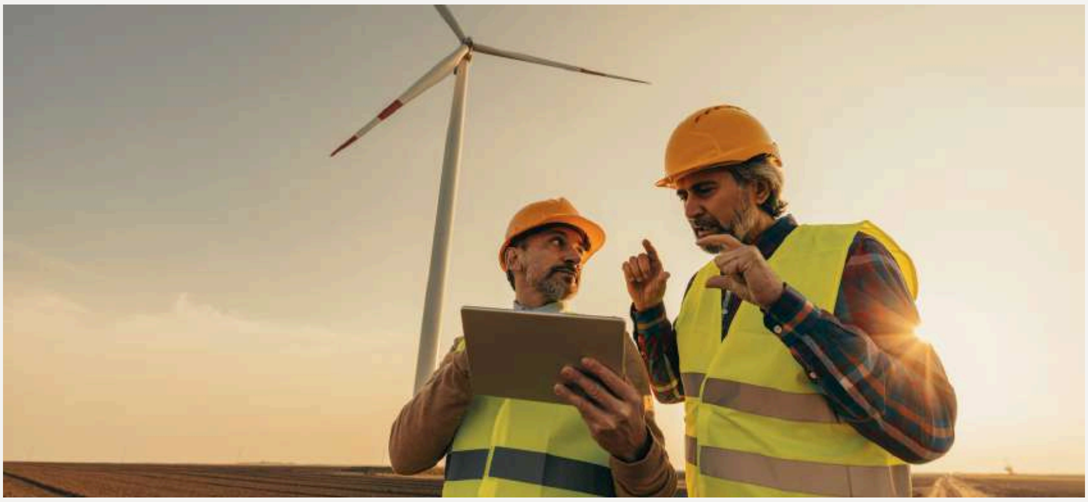
Suppliers should provide detailed interface documentation, participate in design coordination and support commissioning activities. Contracts should include obligations for technical support, training and documentation, as well as remedies for integration failures.

INTELLECTUAL PROPERTY AND REGULATORY RISK

Specialist equipment often incorporates proprietary technology subject to intellectual property (IP) protections. Supply agreements must address licensing rights, usage restrictions and indemnities for IP infringement. Where software or firmware is involved, access rights, update protocols and cybersecurity obligations should be clearly defined.

Regulatory risk includes compliance with product safety standards, grid codes and environmental regulations. Equipment must be certified for use in the relevant jurisdiction and comply with applicable standards for safety, electromagnetic compatibility and performance. In some cases, regulatory changes during construction may affect product eligibility or require design modifications.

Suppliers should ensure that certification and compliance documentation is provided and kept up to date. Contracts should include provisions for regulatory change, testing protocols and liability for non-compliance. They should also address the use of standards that may be advisory rather than mandatory. This is to ensure that subcontractors are not forced to choose between accepting an outdated standard or incurring the additional cost of implementing best practice without contractual recognition or compensation.



CONCLUSION

Specialist suppliers are essential to the successful delivery and operation of renewable energy projects. Their products underpin performance, safety and grid compliance and their engagement carries significant commercial and technical risk. These risks include performance and warranty obligations, delivery and procurement challenges, interface and integration complexity and regulatory and IP compliance. Effective risk allocation requires clear contracting, proactive coordination and robust technical support to ensure that specialist equipment is delivered on time, performs as expected and integrates seamlessly into the broader project.

CHAPTER 7:
LEGAL RISKS ACROSS ALL SUBCONTRACTORS

INTRODUCTION

While each subcontractor type in renewable energy projects faces distinct technical and operational risks, there are several legal and commercial risks that cut across all subcontractors. These risks are not tied to a specific scope but arise from the structure of contracting relationships, statutory obligations and the broader regulatory environment.

In addition, subcontractors operating in remote or regional areas may face challenges related to labour availability, accommodation, and the use of inexperienced local subcontractors. Understanding and managing these risks is essential for subcontractors to protect their commercial interests and ensure compliance across solar, wind and BESS projects.

INSURANCE AND INDEMNITY MISALIGNMENT

Subcontracts often impose indemnity obligations that exceed the coverage provided by standard insurance policies. This misalignment can leave subcontractors exposed to uninsured liabilities, particularly where indemnities are uncapped or extend to third-party losses. These risks are heightened in renewable energy projects, where principals and EPC contractors may seek broad indemnities to cover complex interface and performance risks.

Subcontractors should ensure that indemnities are capped to insured risks and that their insurance policies include appropriate endorsements, such as cross-liability and contractual liability coverage. Legal review of indemnity clauses is essential to avoid exposure beyond policy limits.

BACK-TO-BACK CONTRACTING PRESSURE

Subcontractors frequently inherit obligations from head contracts through back-to-back clauses, without receiving equivalent rights or visibility. This creates a risk of cascading liability, particularly in EPC models where the head contract may contain aggressive performance guarantees, delay provisions or grid compliance obligations.

To manage this risk, subcontractors should seek access to the head contract and negotiate proportional obligations. Where visibility is limited, carve-outs or limitations should be sought to align liability with actual control and influence over project outcomes.

WHS AND SAFETY COMPLIANCE

Under the *Work Health and Safety Act 2011* (NSW) and equivalent legislation in other jurisdictions, subcontractors share concurrent duties with principals and other parties to ensure site safety. Non-compliance can result in significant penalties, even where the subcontractor is not the site controller or responsible for broader site management.

Subcontractors must maintain pre-start safety records, ensure adequate supervision and apply consistent WHS practices across all subcontracted scopes. WHS obligations should be clearly defined in contracts and supported by training, documentation and incident reporting protocols.

ESG AND SUPPLY CHAIN TRANSPARENCY

Renewable energy projects are increasingly subject to other ESG obligations, including under the *Modern Slavery Act 2018* (Cth). Subcontractors may be required to demonstrate ethical sourcing, labour standards and waste management practices, particularly where battery materials or overseas supply chains are involved.

Subcontractors should implement supplier due diligence systems, monitor labour and environmental practices and maintain documentation to support ESG compliance. ESG clauses should be included in sub-subcontracts where relevant and reporting obligations should be clearly understood.

PAYMENT AND RETENTION RISK

Subcontractors may face delayed payments and retention release issues. These risks are exacerbated in multi-tiered contracting structures and can affect cash flow, especially where upstream disputes or delays occur.

To mitigate these risks, subcontractors should negotiate clear payment terms, monitor upstream dependencies and ensure that retention release mechanisms are enforceable. Security of payment legislation may provide additional rights and subcontractors should understand how these apply to their contracts.

Principals may require separate security or retention monies to secure performance guarantees and delay risk. Subcontractors should seek clarity on the purpose, duration and release conditions of each form of security and consider negotiating for staged release and/or substitution with bank guarantees where appropriate.

DISPUTE RESOLUTION AND CLAIMS MANAGEMENT

Renewable energy projects often involve tight timeframes and complex interfaces, increasing the likelihood of disputes. Subcontractors must be prepared to manage claims for delay, variation and disruption and understand their rights under security of payment legislation and dispute resolution clauses.

Maintaining contemporaneous records, issuing timely notices and understanding contractual procedures are critical to preserving entitlements. Legal advice should be sought early when disputes arise, particularly where claims may affect project milestones or financial recovery.

LABOUR AVAILABILITY AND LOCAL SUBCONTRACTOR RISK

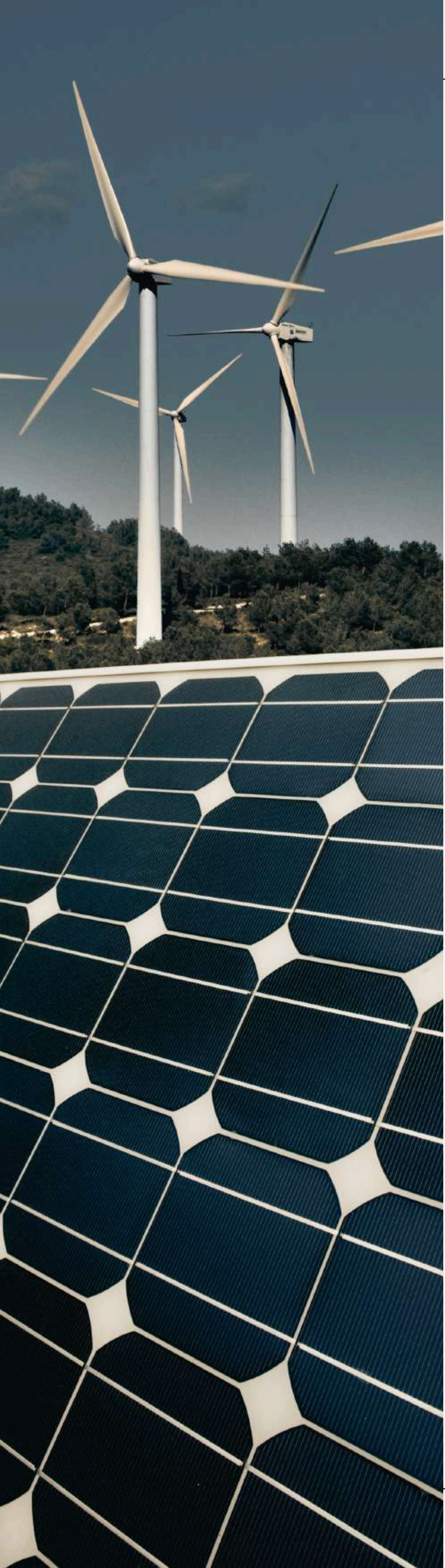
Renewable energy projects are often located in remote or regional areas, where access to skilled labour can be limited. Subcontractors may face challenges in sourcing qualified personnel, particularly for specialised scopes such as high-voltage installation, SCADA integration, or fire safety systems. In some cases, housing and accommodating labour in these areas can also present logistical and cost challenges.

Where local subcontractors are engaged, there is a risk that they may lack experience with utility-scale renewable energy projects or the specific compliance requirements involved. This can lead to quality issues, delays, and increased supervision demands. Subcontractors should assess the capability of local partners carefully and ensure that appropriate training, oversight, and contractual protections are in place.

CONCLUSION

Legal risks across subcontractors are often overlooked in favour of technical and delivery concerns, yet they pose significant threats to subcontractor profitability and compliance. By proactively addressing insurance, indemnity, WHS, ESG, payment and dispute resolution risks, subcontractors can strengthen their contractual position and reduce exposure.

These risks are especially pronounced in renewable energy projects due to their complexity, regulatory scrutiny and evolving standards. Labour-related risks in remote locations also require careful planning and oversight, particularly where local subcontractors are engaged. A strategic legal approach is essential to navigate this environment successfully.



CONCLUSION

Subcontractors are the backbone of renewable energy project delivery. Yet they are often asked to bear risks that are disproportionate to their control, influence or commercial capacity. As the industry continues to evolve, with new technologies, contracting models and regulatory frameworks, subcontractors must become more informed, assertive and strategic in how they engage with risk.

This guide has explored the key risks faced by civil, electrical, mechanical and specialist subcontractors, as well as installers and HV subcontractors. While each subcontractor faces unique challenges, common themes emerge. These are clear scope definition, proactive coordination, realistic programming and fair contract terms.

By understanding how risk is allocated and where leverage exists, subcontractors can better protect their interests, contribute to successful project outcomes and build sustainable businesses in the renewable energy sector.

Kreisson's Renewable Energy team advises subcontractors, suppliers and principals on all aspects of project risk, compliance and contract negotiation. For tailored guidance or contract review, contact ***Tristan Cockman, Special Counsel at Tristan.Cockman@kreisson.com.au***.

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