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Renewable Energy Project Delivery in Asia-Pacific: From Construction Risk to Integration Risk

Reassessing EPC Wrap, Turnkey Lump Sum and Multi-Contracting in Asia-Pacific Renewable Energy Markets

Project success in Asia-Pacific's energy transition is determined less by contractual form than by the capability, governance and experience available to support it. Every delivery model has a legitimate purpose; what differs is the risk profile and the organisational capability required to manage it.

Executive Summary

The engineering, procurement and construction (EPC) contract has become the preferred dominant procurement model for renewable energy across Asia-Pacific. Lenders prefer it, developers request it, and governments encourage it, because a "wrapped" EPC contract is treated as shorthand for price certainty, programme certainty and bankability. That equivalence deserves reconsideration. Across decades of delivery in the region, contractual form and practical delivery capability have drifted apart. The instrument is not defective; it is frequently deployed in market conditions for which it was never designed, and there is an inherent lack of "Think slow, act fast"[1] in planning, decisions and execution.

The same caution applies to turnkey lump sum contracting. Few renewable projects are genuinely turnkey. Critical variables of grid energisation, original equipment manufacturer (OEM) performance and regulatory approval routinely sit outside the contractor's control, and the gap between contractual promise and operational reality produces expectations that no party can satisfy. The rise of multi-contracting (or split contracting) is a rational response, but it does not reduce risk. Instead, it relocates integration (or interface) risk from the contractor to the owner and demands a materially higher level of organisational capability in return.

This reality matters because the character of renewable projects has changed. Delivery once turned on engineering and construction execution. It now turns on the ability to integrate many independent participants operating simultaneously across technical, regulatory, commercial and at times multi-jurisdictional interfaces. Integration risk is displacing construction risk as the dominant challenge, and the effect is sharpest in frontier and emerging markets, where institutional capacity, contractor depth and experienced personnel lag the pace of capital deployment.

> *The success or failure of EPC wrap, turnkey lump sum and multi-contracting is principally determined by the alignment between owner capability, contractor capability, institutional maturity and the management of integration risk. EPC wrap, turnkey lump sum and multi-contracting are each legitimate. None is inherently superior. Their effectiveness depends on market maturity, organisational capability and the availability of experienced people. Participants should spend less effort selecting the 'right' contract and more effort ensuring they hold the capability in-house and through retained third-party advisers to govern the one they choose.*

Projects rarely fail because of the words in their contracts. They fail because the organisations responsible for delivering those contracts do not possess the full capability needed to make them function, and the author suggests that there may also be excessive recurrence of what Flyvbjerg refers to as the "Hidden Hand" that beneficially hides difficulties.[2] The "break-fix model"[3] can be avoided through proper project front-end planning, resourcing and ongoing management. Avoiding the 'break' results in no need to 'fix'.

The argument of this commentary is therefore practical rather than doctrinal, and it is addressed to those who must resource and govern delivery, not merely paper it.

[1] Flyvbjerg, B. and Gardner, D. (2023) '*How Big Things Get Done: The Surprising Factors That Determine the Fate of Every Project*'. Currency/Macmillan. pp 15-32. Flyvbjerg and Gardner attribute many hallmark project failures to insufficient front-end planning; their organising maxim, "think slow, act fast", advocates slow and rigorous planning followed by rapid execution.

[2] Flyvbjerg, B. (2014). '*What you should know about megaprojects and why: An overview*'. Project Management Journal, 45(2). pp 13-14.

[3] Flyvbjerg (2014). p12.

1. Introduction

Asia-Pacific has become the centre of gravity for global renewable energy investment, and governments across the region are pursuing decarbonisation, energy security and economic growth simultaneously, under compressed timelines.[4] As capital has accelerated, the nature of project risk has shifted. A decade ago, project delivery discussions centred on generation technology, energy yield and the capital expenditure required to deliver a 50 MW project. Today, the conversation has shifted to multi-gigawatt portfolios and the systems required to integrate them. The questions that now decide outcomes are different: who owns integration risk, who coordinates the interfaces between independent participants, who manages evolving regulatory obligations, how is the rapid change in technology managed, and who bears the consequences when procurement assumptions prove wrong. Given the scale and complexity of current renewable energy projects the implications of project failures can result in substantial commercial and legal outcomes.

These questions have grown in importance because renewable projects have also become more fragmented. A conventional thermal station was relatively self-contained; a single EPC contractor could control a large share of or the full project activity. A modern utility-scale wind project is not. It typically draws together a mix of designers, a wind turbine OEM, a civil balance-of-plant contractor, an electrical balance-of-plant contractor, an owner's engineer, a transmission network operator, environmental, aviation and telecommunications regulators, independent certifiers, technical advisers, lenders, insurers and more. Integration of battery energy storage (BESS) adds a further layer, and solar projects carry their own chain of specialist suppliers and interface points. Delivery is becoming less about traditional construction and more about integration and risk management.

Understood in this way, the modern renewable project is better characterised as a systems-integration undertaking than as a traditional construction project. This commentary advances a broader proposition. Renewable energy projects are no longer principally construction projects, they are systems-integration projects. Accordingly, the question is no longer which procurement model best allocates construction risk, but which model most effectively governs integration risk. Project outcomes are increasingly determined not by contractual form itself, but by the alignment between organisational capability, institutional maturity and the capacity to coordinate complex systems of independent participants.

That shift would matter less if procurement had kept pace. It has not. Many participants continue to buy projects using models developed for an earlier era, and 'future proofing' with respect to technology and dispatch protection under certain tariff conditions is an essential consideration. The EPC wrap endures because it appears to simplify complexity. One contract, one contractor, one programme, one price, one point of responsibility. The proposition is commercially attractive and increasingly misleading. It assumes, all at once, mature contractor markets, experienced owners, stable regulation, well defined scope, limited third-party dependency, sufficient human capital, and EPC competence. Those conditions are not universally present, least of all in frontier and emerging markets.

The author's experience across the Asia-Pacific region over the past three decades developing and constructing complex infrastructure and renewable energy suggests that what was once a default call for EPC wrap tenders has transitioned to multi-contracting, a shift that has accelerated over the past decade.

The consequence is predictable. Risks that the parties believed they had transferred reappear during execution, recast as delay events, variations, force majeure claims, disputes over who owns an interface, and at times into health and safety exposures.

The project has not become riskier as the parties have discovered that the risk was never transferred. The right question is not whether to use EPC wrap, turnkey lump sum or multi-contracting. It is which organisation is best equipped to manage integration risk, a question whose answer differs by project, market and project sponsor composition. No model overcomes an absence of capability, and capable

[4] International Energy Agency. (2024). '*Southeast Asia Energy Outlook 2024*'. IEA, Paris. https://iea.blob.core.windows.net/assets/ac357b64-0020-421c-98d7-f5c468dadbof/SoutheastAsiaEnergyOutlook2024.pdf

organisations succeed under several models. The emphasis belongs on governance and risk management, not on the contract. Stated plainly, the success or failure of each model is principally determined by the alignment between owner capability, contractor capability, institutional maturity and the management of integration risk. The sections that follow examine those four variables in turn.

Disputes are evolving along the same axis. Historically disputes arose from engineering failures; however, today they increasingly arise from integration failures, grid operators, OEMs, regulators, supply chain and contractors who occupy overlapping spheres of influence. And contracts drafted around discrete scopes struggle to govern dynamic systems with many independent actors. The result is a growing pipeline of disputes whose origins are organisational rather than technical, and the trend will accelerate. For that reason, delivery models deserve renewed scrutiny.

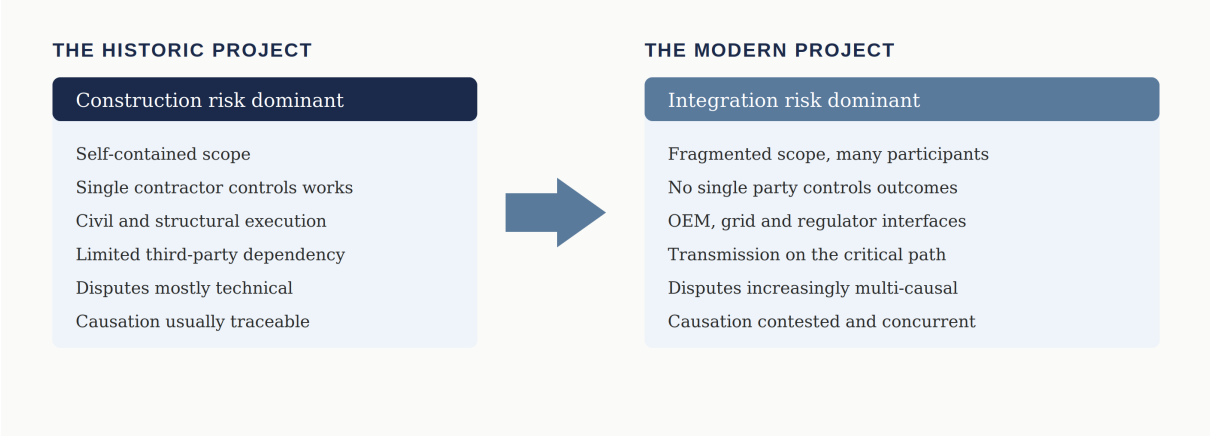

Figure 1. The focus of project risk has moved from construction execution to systems integration.

SECTION 2 · DELIVERY MODELS

2. Understanding the Three Delivery Models

The debate over EPC wrap, turnkey lump sum and multi-contracting is usually oversimplified into a search for the superior model. That framing is unhelpful, because each structure has legitimate applications and each carries specific risks. All three can produce successful projects, and all three can fail. The variable that decides the outcome is not the contract but the alignment between contractual assumptions and organisational capability. As projects fragment technically, the procurement model increasingly does one thing above all. It determines where integration risk resides. Whichever model is chosen, its outcome turns on the same alignment: whether owner capability, contractor capability and institutional maturity are sufficient to manage the integration risk it creates.

2.1 The EPC wrap

The EPC wrap is better understood as a governance model than as a contract. The contract is the instrument through which authority, accountability and integration responsibility are allocated. Successful EPC delivery depends on those boundaries holding throughout execution. Unsuccessful EPC projects are frequently distinguished not by defective drafting but by the gradual erosion of those boundaries, as owners reassert control while continuing to expect the contractor to carry single-point

responsibility, and ineffective stewardship of shared responsibilities and ownerships create adverse outcomes.[5]

The appeal of the EPC wrap is its simplicity. A single counterparty is responsible for engineering, procurement, construction, commissioning and handover. Lenders gain simplified due diligence, and owners gain a single contractual interface. Under the right conditions the model works very well, as large combined-cycle gas turbine plants, desalination facilities and mature transmission projects have shown repeatedly. The standard instrument, the FIDIC Silver Book, was written precisely for projects where the contractor can take single point responsibility for a defined output against a fixed price and date.[6] Its first edition, part of the 1999 'rainbow suite', expressly allocated a wide band of risk to the contractor in exchange for price and time certainty.[7]

That allocation only holds where a series of assumptions hold together. The contractor possesses genuine integration capability, scope is mature at award, the owner refrains from re-asserting control over delegated responsibilities, regulation is relatively stable, third-party dependencies are limited, and both parties understand what the model actually requires of them. The last assumption is the one most often missed.[8] Owners frequently believe an EPC contract lets them transfer responsibility while retaining control. Contractors read the same document as conferring authority while preserving commercial flexibility. Both readings cannot be right.

The tension surfaces under stress. An owner who issues design review comments that alter design assumptions is no longer observing delivery, it is considered to be participating in it. Procurement approvals that constrain the contractor's choices can create variation entitlements. The wrap begins to unravel, not because the contract is defective but because its governance boundaries have blurred. The phenomenon is structural across the region. Projects continue to speak of single point responsibility long after responsibility has, in fact, become distributed.

The contract remains wrapped; the project does not.

This erosion follows a recognisable pattern, which may be termed governance creep. Owners gradually reinsert themselves into decisions they have contractually delegated, while contractors seek to preserve commercial flexibility by resisting responsibility for dependencies beyond their control. Boundaries blur, the nominal single point of responsibility dissolves, and by the time a dispute crystallises responsibility has already become distributed among several participants. Governance creep is among the most common precursors to EPC disputes precisely because it is incremental and seldom visible until delivery is under stress.

Owner involvement should not be conflated with owner interference. Sophisticated owners govern actively while respecting the responsibilities they have delegated. Difficulty arises only where an owner seeks to retain operational control while still expecting the contractor to carry single point accountability. That dual expectation is structurally unsustainable, and over time it shifts the contest from whether technical obligations were performed to who was, in fact, directing whom. Deferred

[5] Project Management Institute. (2021). '*A Guide to the Project Management Body of Knowledge (PMBOK Guide) (7th ed.)*'. PMI, Newtown Square, PA. https://tegnum.edu.pe/wp-content/uploads/2023/09/Project-Management-Institute-A-Guide-to-the-Project-Management-Body-of-Knowledge-PMBOK-R-Guide-PMBOK%C2%AE%EF%B8%8F-Guide-Project-Management-Institute-2021.pdf

[6] Fédération Internationale des Ingénieurs-Conseils. (FIDIC). (2017). *Conditions of Contract for EPC/Turnkey Projects (Silver Book) (2nd ed.)*. FIDIC, Geneva.

[7] Fédération Internationale des Ingénieurs-Conseils. (FIDIC). (1999). *Conditions of Contract for EPC/Turnkey Projects (Silver Book) (1st ed.)*. FIDIC, Geneva.

[8] Nael G. Bunni, '*Managing Risk, FIDIC's International Conditions of Contract: A Two-Day Seminar organised by IBC/FIDIC*' (seminar paper, December 2005). p11. https://fidic.org/sites/default/files/5%20bunni_managing_risk_ibc_oct05.pdf.

interface problems compound the effect, accumulating quietly as a form of integration debt that remains invisible until commissioning forces a reckoning.

The economics of the wrap are frequently misread. A contractor asked to carry design, supply, construction and integration risk on a fixed price and date will price that exposure, fund it through contingency and security, and recover it in the lump sum. The wrap is rarely cheaper, only more certain at the moment of award. Its protections, such as performance bonds, retention, delay liquidated damages and parent-company guarantees, are only as strong as the contractor's balance sheet and its genuine ability to integrate. Where that ability is absent, the single point of responsibility becomes a single point of failure, and the owner that believed it had purchased certainty finds it has purchased a counterparty credit risk instead.

2.2 Turnkey lump sum contracting

'Turnkey' is among the most overused terms in renewable procurement. Its original meaning was precise. The contractor designs, procures, constructs, commissions and hands over a fully functioning facility, so the owner need only turn the key. That concept is hard to reconcile with modern projects, and most renewable energy projects, particularly wind energy, illustrate the point.

Three critical variables routinely sit outside the contractor's control. In the example of wind energy, the first is the turbine itself, often supplied under a separate Turbine Supply Agreement between developer and OEM. The EPC contractor may coordinate installation but does not manufacture, certify or technically control the machines, and global turbine supply chains remain tight.[9] The second is grid energisation, where the transmission grid operator sets acceptance testing, energisation sequence and commissioning timelines. The third is regulatory approval, where agencies act on statutory obligations rather than project schedules. Remove these from the contractor's control and little remains that is genuinely turnkey. A substantial construction scope persists, but the project has become a sophisticated coordination exercise.

The unavoidable facts matter because expectations diverge. Developers often believe they have transferred risk; however, contractors often know they have not. When delay occurs, contractors characterise events as force majeure, employer risk events or third-party failures, while developers invoke single point responsibility. Disputes follow because contractual language and practical reality have parted company. In such projects the contract functions as an instrument of expectation management rather than risk transfer, and it is healthier to recognise that openly than to discover it in a notice of dispute.

In practice, turnkey and EPC have largely converged, and the more useful distinction is between a true single contract wrap and a multi-contracting (or split) package EPC in which the owner, or a nominated wrap contractor, knits several large packages together. Offshore wind has made this explicit, with turbines, foundations, array and export cabling, offshore substations and onshore works routinely let as separate packages, the integration risk consciously retained and managed rather than transferred. The label matters less than the allocation beneath it, and a contract described as turnkey that leaves the owner holding the interfaces is turnkey in name only.

[9] Global Wind Energy Council. (2024). *Global Wind Report 2024*. GWEC, Brussels. P 65. https://sawea.org.za/sites/default/files/content-files/Market%20Reports/GWR-2024_digital-version_final.pdf

2.3 Multi-contracting

Multi-contracting is a rational response to these realities. Rather than engaging one EPC contractor, the owner contracts directly with specialist providers. Engineering consultants, civil and electrical contractors, OEMs, commissioning specialists and an owner's engineer. The logic is sound. Where genuine EPC integration capability is scarce, owners may be paying a premium for risk transfer that does not occur, and may prefer to retain control. The structure can deliver real advantages in transparency, schedule visibility, reduced contingency premiums and flexibility. Split responsibility forms such as the FIDIC Yellow Book can support parts of this approach where design and construction sit with different parties.[10] The benefits come at a price. The owner assumes responsibility for integration. Every interface becomes the owner's, and the owner's organisation effectively becomes the EPC contractor. This is consistently underestimated. Multi-contracting is not a simplification strategy, it is a capability strategy. An owner that could not govern a single EPC contractor is unlikely to manage five specialist contractors and multiple suppliers at once, because the governance burden rises sharply.

The multi-contracting model can be highly effective for sophisticated organisations that possess a strong owner's team function, experienced project leadership and well-resourced third-party advisers. However, it can become highly problematic when adopted as a substitute for capability the owner does not possess. It reallocates integration risk to the owner and, in doing so, demands a correspondingly higher level of organisational maturity and governance than is often recognised.

What makes multi-contracting work in practice is the integration machinery the owner puts in place of the wrap. A coordinated interface matrix, back-to-back programme obligations, clear battery-limit and handover definitions and, frequently, an interface coordination or 'wrap' deed that recreates synthetically the single point of responsibility the owner has chosen not to buy. Some owners appoint a managing contractor or an engineering, procurement and construction management (EPCM) contractor to provide a 'soft wrap', delivering integration as a service while the contractor and supply packages remain under the owner. Under owner-led structures the construction packages often sit on employer design forms such as the FIDIC Red Book, which places design responsibility with the owner and makes the depth of the owner's engineering function decisive. None of this removes integration risk, it makes the risk visible, governable and owned by a party resourced to manage it.[11]

[10] Fédération Internationale des Ingénieurs-Conseils. (FIDIC) (2017). *Conditions of Contract for Plant and Design-Build (Yellow Book) (2nd ed.).* FIDIC, Geneva.

[11] Fédération Internationale des Ingénieurs-Conseils. (FIDIC). (2017). *Conditions of Contract for Construction (Red Book) (2nd ed.).* FIDIC, Geneva.

2.4 A comparative view

Set side by side, the three models trade the same considerations in different proportions. The table on the following page is a practitioner's summary rather than a scoring system. The entries describe tendencies, not guarantees, and every row is sensitive to the capability of the parties involved.

Dimension	EPC Wrap	Turnkey Lump Sum	Multi-Contracting
Price certainty	High at award	Moderate	Lower but manageable
Cost transparency	Lower	Lower	Higher
Lender familiarity	High	High	Moderate & increasing
Owner control	Lower	Lower	High
Interface burden on owner	Lower	Moderate	High
Contractor capability needed	Very high	Very high	Moderate
Owner capability needed	Moderate	Moderate	Very high
Flexibility to change	Low	Low	High
Where integration risk sits	Contractor (nominally)	Shared / contested	Owner
Frontier-market suitability	Conditional	Conditional	Moderate to high

Table 1. Comparative assessment of the three delivery models. No model is superior; each relocates risk.

SECTION 3 · REGIONAL CONTEXT

3. Why Asia-Pacific Is Different

Asia-Pacific is often discussed as a single market. It is not. Asia-Pacific should not be viewed as a renewable energy 'market' at all. It is a collection of highly diverse institutional ecosystems operating at different stages of economic development, infrastructure maturity and regulatory evolution. Procurement structures that function effectively in Australia or South Korea may be wholly unsuitable in Mongolia, Indonesia, Vietnam or frontier markets elsewhere in the region. This diversity is not an inconvenience to be managed; it is one of the principal variables that procurement strategies must accommodate.

These differences are not cosmetic. They change delivery outcomes, and six characteristics in particular set the region apart from Europe and North America.

Institutional maturity varies widely

Institutional capability is the most underestimated variable in project success. Developers scrutinise contractor capability closely while paying far less attention to the institutions that ultimately govern outcomes. The transmission operators, regulators and permitting agencies. In mature markets their processes are well established, in emerging markets they are still forming. The World Bank identifies

institutional capacity constraints as a principal barrier to accelerating deployment across emerging economies.[12]

Institutional capability and capacity set accurate permitting timelines, thorough grid connection studies, robust construction delivery methodologies, achievable energisation processes, security of environmental approvals, critical attention to land access and pre-planned operational acceptance testing. No contract accelerates an institution that lacks resources, and no procurement model should be designed as if it could.

Contractor depth is uneven

The author's observations extend further and are informed by more than two decades of direct EPC experience across infrastructure and renewable energy projects throughout Asia-Pacific. What was once a comparatively "hard-nosed" EPC environment, characterised by clear accountability, well-defined governance boundaries and seasoned management teams with broad multidisciplinary experience, has gradually evolved. In some parts of the region, there is now a discernible gap between the expectations placed upon EPC contractors and the capability available to discharge those responsibilities. Increasingly, sponsors and lenders are discovering that the contractual allocation of risk does not always align with the practical ability of contractors to integrate engineering, procurement and construction functions as a single, cohesive delivery system. In certain cases, organisations undertaking EPC responsibilities have possessed strong capability in individual disciplines, but more limited experience in integrating the engineering, procurement and construction functions collectively. This observation should not be interpreted as a criticism of individual organisations, rather, it reflects a structural consequence of an industry that has expanded more rapidly than the supply of experienced personnel.

External dependencies are becoming the critical path

Across Asia-Pacific, generation increasingly depends on grid-connection and network programmes, OEMs, regulators, environmental agencies, independent certifiers, and various authorities that the project itself does not control. Australia is the clearest illustration, where the pace of grid build-out and supply chain constraints have become principal constraints on deployment.[13] The issue is not confined to Australia. Vietnam, Indonesia, Mongolia and the Philippines all confront versions of it. The implication for delivery is direct. No EPC contractor can guarantee outcomes built on infrastructure it does not own, nor on the myriad of external dependencies. It has been increasingly evident that the economics and realities of grid integration, supply chains, and skilled labour force are accelerating to be the determining factors of the whole energy transition, despite recognition and in many cases ongoing government policies to rapidly expand grid networks and address other constraints.[14]

[12] World Bank. (2023). '*Scaling Up to Phase Down: Financing Energy Transitions in the Power Sector*.' World Bank, Washington, DC. pp 5,11,35. https://openknowledge.worldbank.org/server/api/core/bitstreams/d0c0c6a2-f331-4bb9-b9d1-638d1f039e7d/content

[13] Australian Energy Market Operator. (2024). '*2024 Integrated System Plan for the National Electricity Market*.' AEMO, Melbourne. https://www.aemo.com.au/-/media/files/major-publications/isp/2024/2024-integrated-system-plan-isp.pdf?rev=b811f5d66df24e0a980ce0df8eaa5687&sc_lang=en

[14] International Energy Agency. (2023). '*Electricity Grids and Secure Energy Transitions*.' IEA, Paris. https://iea.blob.core.windows.net/assets/ea2ff609-8180-4312-8de9-494bcf21696d/ElectricityGridsandSecureEnergyTransitions.pdf

Regulatory complexity is increasing

Renewable projects intersect with multiple regulatory systems including environmental, civil aviation, telecommunications, transport routes, archaeological, palaeontological and cultural-heritage approvals, transmission agreements and grid connection studies. These processes are becoming more complex, not less.

Contractors cannot meaningfully absorb such risks, and the reality is that owners retain them regardless of contractual wording.

Human capital shortages persist

One of the most significant constraints facing the region is human capital. The industry has expanded faster than the supply of experienced practitioners, and projects now compete for a small pool of individuals.[15]

Experience is held by people, not by organisations. A project manager with a decade of regional wind or solar or hydro experience cannot be replaced by three junior engineers. Expertise does not scale linearly, and projects consistently underestimate this. The consequences become visible during construction, which is the most expensive moment to discover them, and the impact can be extremely costly. Put plainly, the industry does not suffer from a shortage of contracts, it has an experience shortage. Human capital rather than financial capital is increasingly becoming the scarcest project resource.

Financing structures shape procurement

A final distinguishing feature is the weight financing places on procurement. Across much of the region projects are funded on a limited-recourse basis by multilateral lenders, and lenders impose their own logic on the delivery model. Their preference for the EPC wrap is rational from a credit perspective. A single wrapped contract simplifies the lenders' technical due diligence and concentrates completion risk in one counterparty. That preference can nonetheless push owners toward a wrapped structure even where the contractor market cannot truly support it, producing a bankable contract layered over an un-bankable delivery reality. The lenders' technical adviser then becomes a central actor, and the quality of that appointment materially affects outcomes. In frontier and emerging markets, the financing structure frequently dictates the procurement model before capability is assessed at all, precisely the wrong sequence.

The author's observations over recent years in Asia-Pacific confirm that lenders themselves are becoming more pragmatic. Historically, lenders strongly preferred wrapped EPC structures because they simplified technical due diligence and concentrated completion risk within a single counterparty. Increasingly, however, lenders are demonstrating greater acceptance of multi-contracting strategies where sophisticated sponsors can demonstrate robust governance systems, experienced owner's teams, strong programme controls and high-quality third-party advisers. This should not be interpreted as a departure from traditional bankability principles. Rather, it reflects an acknowledgement that organisational capability may now be a better predictor of project outcomes than contractual form alone.

[15] International Renewable Energy Agency. (2024). '*Renewable Energy and Jobs: Annual Review 2024*.' IRENA, Abu Dhabi. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2024/Oct/IRENA_Renewable_energy_and_jobs_2024.pdf

Capability should inform the structure. Too often the structure is fixed first and capability is simply assumed to follow.

This principle is increasingly reflected in international infrastructure governance guidance. The OECD recommends that delivery models should be selected on the basis of value for money and optimal allocation of risk, explicitly cautioning against institutional, procedural, fiscal or accounting biases toward any particular delivery model.[16] This observation is particularly relevant to Asia-Pacific renewable energy projects, where procurement structures are often selected because they satisfy lender preferences or market convention rather than because they align with project capability. Procurement decisions should be capability-led rather than convention-led.

4. The Myth of Absolute Risk Transfer

The most persistent misconception in infrastructure delivery is that risk can be transferred absolutely. It cannot. Risk can only be allocated, and contractual allocation is not the same as practical control. Merrow aptly documented this across industrial megaprojects. Allocation on paper often bears little resemblance to outcomes, because projects remain dynamic systems with many participants and a there remains "a basic lack of being able to pursue a common goal with clarity and good behaviour".[17]

Renewable projects are especially exposed to the myth of absolute risk transfer, and several recurring categories make the point.

Grid connection risk

A contractor may commit to a commercial operation date, but energisation typically depends on transmission operator schedules, system studies, acceptance testing and dispatch integration, none of which the contractor controls. What looks like a fixed obligation is in substance a contingent one. The contractor will deliver provided others perform. That is conditional allocation, not transfer.

OEM and supply-chain risk

Projects are increasingly dependent on OEMs for equipment and module manufacturing slots, software, blade availability and specialist technicians. These variables lie largely outside EPC control, and supply chain delay propagates through the programme. Global supply chains for clean energy equipment and critical minerals remain concentrated and periodically strained, which the contract can document but cannot prevent.[18]

[16] OECD. (2025). '*Recommendation of the Council on the Governance of Infrastructure' (OECD/LEGAL/0460)*. Paris: Organisation for Economic Co-operation and Development. pp 7-8. https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0460

[17] Merrow, E. W. (2011). '*Industrial Megaprojects: Concepts, Strategies, and Practices for Success.*' John Wiley & Sons, Hoboken, NJ. p1.

[18] International Energy Agency. (2024). '*World Energy Outlook 2024.*' IEA, Paris. https://iea.blob.core.windows.net/assets/140a0470-5b90-4922-a0e9-838b3ac6918c/WorldEnergyOutlook2024.pdf

Regulatory and weather risk

Regulatory approval is an institutional risk. Statutory obligations supersede project schedules, and no clause accelerates an under-resourced regulator. Weather can be mitigated but not controlled, and climate-related disruption is increasing. Both are better acknowledged in the programme than assumed away in the recitals.

Insurance and the limits of contractual cure

A related misconception is that insurance and force majeure clauses close the gap left by imperfect risk transfer. They narrow it, they do not close it. Construction all-risks and delay-in-start-up policies respond to defined physical loss, not to the diffuse integration failures that now drive renewable disputes. A grid operator's slow energisation, an OEM's missed delivery slot, or a regulator's revised condition rarely triggers an indemnity. Force majeure and change-in-law provisions allocate consequences but resolve nothing about coordination, and they frequently become the battleground rather than the cure. The practical lesson is that the residual exposure left by conditional allocation must be actively managed through governance and competent people, not parked in an insurance programme or a boilerplate relief clause and forgotten. And not glossed over by inexperienced or overly optimistic participants.

The cost of theoretical transfer

The practical consequence is straightforward. Owners pay premiums for risk transfer that does not occur, contractors price contingency into bids, residual risk stays embedded in the project, and the owner ultimately retains exposure despite considering that risk has been transferred. The author considers that this has become an evident inefficiency in renewable energy procurement and appears to be born from "optimism bias"[19] and "strategic misrepresentation".[20]

Drafting a contract around risk(s) does not transfer the underlying exposure if the named party cannot control it.[21] As Knowles' discussion of risk allocation illustrates, the more useful question is not what the contract can transfer, but which participant is genuinely capable of understanding and then controlling the risk.[22] Risk should generally remain with the party best able to manage it, and that party must be appropriately resourced to discharge that responsibility.

[19] Flyvbjerg, B. and Gardner, D. (2023). P140. Optimism bias, citing Kahneman, is the most significant of the cognitive biases, an overestimation and certainty that one will not suffer the same failures as others.

[20] Flyvbjerg, B. and Gardner, D. (2023). P37. Strategic misrepresentation is described as the tendency to deliberately and systematically distort or misstate information for strategic purposes.

[21] Merrow, E. W. (2011). pp 6-7.

[22] Knowles, R. (2012). '*200 Contractual Problems and their Solutions (3rd ed.).*' Wiley-Blackwell, Chichester. pp 239-241.

5. The Capability Deficit and the Resourcing Imperative

If integration risk is the central challenge, capability is the central solution. The decisive question on most Asia-Pacific projects is not which contract was signed but whether the organisations responsible for delivery hold the capability to govern it. The regional deficit operates on three levels, and addressing it is less a matter of headcount than of experience, judgement and the willingness to retain expertise that an organisation does not hold in-house.

Owner-side capability

Many owners are financially strong but operationally light. They can raise capital and negotiate terms, but they do not always possess the technical depth to govern delivery, and the gap is most visible in the owner's engineering and management function. Furthermore, too often the owner's engineer is treated as an administrative observer reviewing reports, assessing progress, certifying payments, and occasionally visiting the project site. On a modern renewable project, the role must be a genuine risk-management function spanning technical oversight, programme controls, grid integration, commercial administration and stakeholder management. An under-resourced owner's engineer is not a saving, it is deferred cost, usually realised during commissioning or in a subsequent dispute, generally with the owner bearing the risks and costs.

Sponsors should view procurement decisions as investment decisions rather than legal decisions. Procurement structures determine how organisational capability is deployed throughout a project's lifecycle and may materially influence long-term investment returns.

Contractor-side capability

On the contractor side, the central issue is the gap between contractual form and operational substance. A firm may sign as an EPC contractor while functioning as a construction manager. It may hold the contractual title without the engineering, procurement and commissioning depth the title implies. The mismatch is dangerous because it is invisible at award and expensive in execution. Diligence should therefore test capability rather than documentation. Not whether a contractor has signed EPC contracts before, but whether it has genuinely integrated comparable scopes, and whether the individuals who did so are assigned to this project. True and demonstrable experience that is relevant.

Expertise resides in individuals, not organisations

This is the point practitioners understand and procurement processes routinely ignore. Capability is carried by people. A contractor's track record is only as relevant as the individuals actually deployed, and the departure of a single experienced project director can change a project's risk profile overnight. Records, programmes and interface registers are the institutional memory that protects a project when individuals move on, and they must be established at notice to proceed, not reconstructed after a dispute emerges. Projects should evaluate and enforce the named individuals. The project director, construction

manager, commissioning manager with the same rigour applied to the corporate entity and should secure their continuity contractually where possible.

The role of third-party advisers

No single organisation, however capable, holds every discipline a modern renewable project requires. The practical answer is to resource deliberately. To supplement in-house teams with experienced third-party advisers in the disciplines where depth is thin. Grid integration, geotechnics, programming and forensic planning, and specialist technical assurance. This is most acute in frontier and emerging markets, where local capability is still developing and financing structures already demand a high standard of governance.[23] Retaining external expertise is not an admission of weakness and it is not an avoidable cost, it is the discipline that allows an owner to adopt a multi-contracting strategy, or to govern an EPC wrap properly, without pretending to capabilities it does not have. The cost of competent advisers is consistently lower than the cost of the problems that invariably arise, and certainly lower than the cost of disputes that their absence produces.

> *The model is a vehicle, and the capability is the engine. Whichever delivery method is chosen, it must be resourced with experienced personnel and, where in-house depth is lacking, with retained third-party consultants. That resourcing decision, made before procurement, shapes project outcomes more than the choice of contract itself.*

The economics reinforce the point. A competent owner's engineer and a panel of specialist advisers represent a small fraction of total project cost, typically low single digit percentages, yet the disputes their absence invites routinely run to tens of millions, before the indirect costs of delay, financing and management distraction are counted. Under-resourcing the governance function is therefore not a saving but a deferred and magnified cost, usually crystallised at the least convenient moment. The decision to resource capability properly is among the highest-return decisions available to a project, and it is made, or missed, long before the first claim is filed.

[23] Asian Development Bank. (2024). '*Asia–Pacific Climate Report 2024.*' ADB, Manila. https://www.adb.org/sites/default/files/publication/1008086/asia-pacific-climate-report-2024.pdf

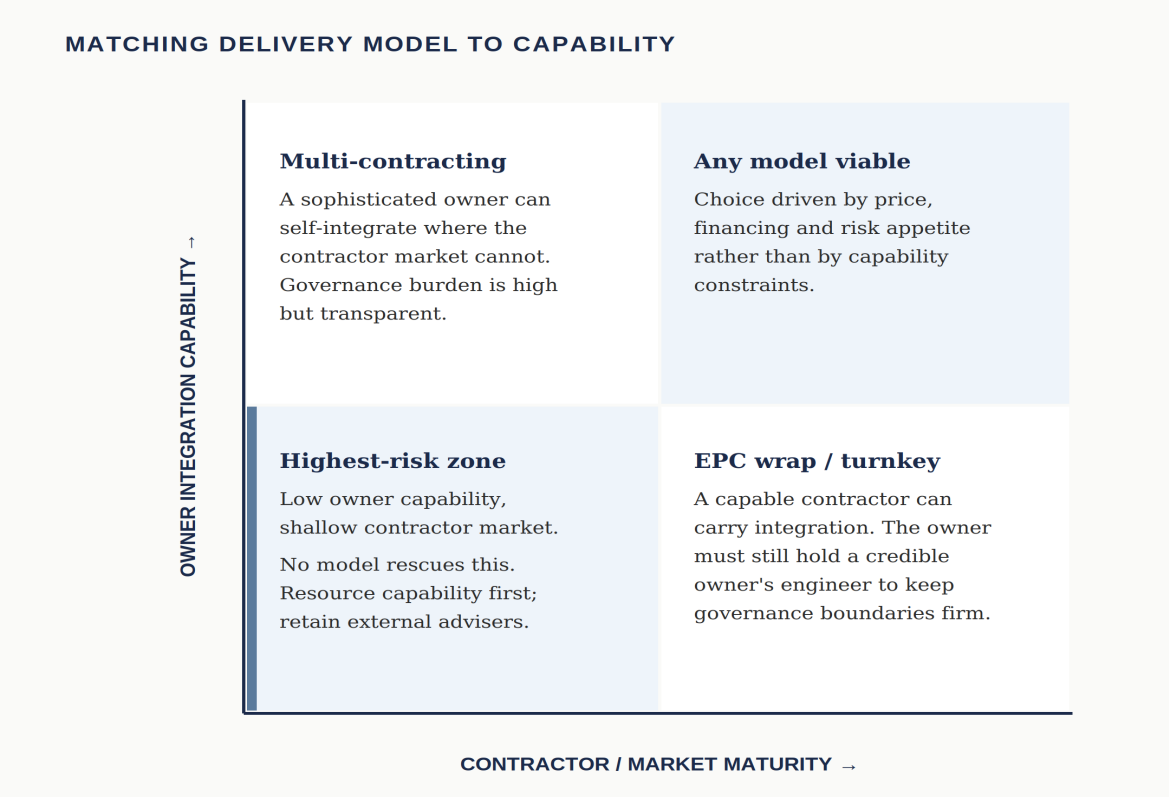

Figure 2. Matching the delivery model to capability and market maturity. The model follows the capability, not the reverse.

SECTION 6 · REGIONAL CASE STUDIES

6. Asia-Pacific in Practice

Six markets illustrate how delivery models perform under different institutional, contractor and capability conditions. The observations are general rather than project specific, and they are intended to show why a single procurement model cannot be applied uniformly across so diverse a region.

Australia: institutional maturity does not eliminate integration risk

Australia possesses one of the most mature renewable energy markets in Asia-Pacific, supported by sophisticated sponsors, experienced contractors, established regulatory institutions and a deep advisory ecosystem. Yet project delivery remains under considerable pressure. The reasons are instructive because they demonstrate that institutional maturity does not eliminate risk; rather, it changes its character.

The principal challenge is no longer the physical construction of renewable energy assets. Increasingly, projects are integration exercises that require multiple independent participants to operate as a coordinated system. Owners, EPC contractors, OEMs, transmission operators, independent certifiers, financiers, owner's engineers and regulators all influence project outcomes, often while operating under separate contractual arrangements and competing commercial incentives.

Australia has also exposed a growing distinction between contractual accountability and practical control. Even sophisticated EPC contractors cannot guarantee outcomes that depend upon external

participants or regulatory processes that sit outside their authority. Consequently, sponsors are investing more heavily in owner's engineer functions, programme controls and specialist advisers to supplement traditional procurement structures.

The Australian experience demonstrates that mature institutions reduce, but do not remove, integration risk. Successful projects are increasingly characterised not by superior contracts, but by organisations that possess the governance capability, experienced personnel and disciplined programme management required to coordinate multiple independent participants throughout the project lifecycle.

The centre of gravity has also moved from building plant to connecting it, given the grid infrastructure constraints.

Vietnam: the limits of accelerated project development

Vietnam's rapid expansion of renewable energy under successive feed-in tariff regimes was one of the most remarkable deployment programmes in Asia-Pacific. However, it also demonstrated the limitations of expecting procurement structures to compensate for compressed project development cycles.

The pace of investment created significant pressure to achieve commercial operation within prescribed tariff windows. Consequently, many projects entered procurement before technical, commercial and regulatory assumptions had fully matured. EPC and turnkey contracts were therefore expected to absorb risks that were not fully understood or, in some cases, not yet defined.

The result was a widening gap between contractual assumptions and project realities. Project outcomes became increasingly dependent upon factors outside contractor control, including permitting processes, interconnection studies, regulatory approvals and the readiness of external infrastructure. Where these dependencies did not progress in parallel, owners frequently retained the commercial consequences regardless of contractual wording.

Vietnam therefore provides an important lesson in sequencing. EPC contracts are highly effective mechanisms for delivering mature projects, but they are considerably less effective when they are used to mature projects during construction. Flyvbjerg and Gardner describe premature commitment as a recurring characteristic of underperforming projects, a "commitment fallacy[24] while Merrow[25] similarly emphasises the importance of front-end planning before execution. Vietnam illustrates both propositions. Ambition outpaced the capacity of institutions and project participants to absorb it, demonstrating that procurement structures cannot compensate for compressed project development cycles.

Indonesia: the capability of the owner's organisation often matters more than the procurement model

Indonesia demonstrates that the effectiveness of procurement structures is heavily influenced by the capability of the owner's organisation. The country's archipelagic geography, decentralised permitting processes, evolving local content requirements and the central role of the state utility create a project environment in which governance capability is often more important than contractual form.

[24] Flyvbjerg, B. and Gardner, D. (2023). pp 33-51, see p37 specifically referring to "commitment fallacy".

[25] Merrow, E. W. (2011). pp 4-5.

EPC structures remain common and continue to offer advantages, particularly for sponsors seeking simplified contractual interfaces and greater certainty around cost and schedule. However, genuine integration capability is unevenly distributed and concentrated among a relatively small number of organisations. Projects frequently depend upon multiple external stakeholders, including local authorities, permitting agencies, landowners, OEMs and PLN, none of whom can be fully integrated through contractual mechanisms alone.

The experience of projects such as the 192 MWp Cirata Floating Solar Project demonstrates the importance of strong governance systems and stakeholder coordination. The project's successful delivery was not solely a function of procurement structure, but rather the result of substantial investment in project management, institutional coordination and experienced advisory support.[26]

Indonesia therefore illustrates an important proposition. Procurement structures should be selected according to the capability available to govern them. Sophisticated owners with experienced in-house teams, strong owner's engineer functions and retained advisers may derive significant benefits from multi-contracting because they can directly manage specialist contractors and maintain greater transparency over project interfaces. For less experienced organisations, the same model may create governance burdens that exceed available capability.

This reinforces a broader observation advanced throughout this commentary. Multi-contracting should not be viewed as a cost reduction strategy, but as a capability strategy. It can be highly effective when adopted by sophisticated organisations with mature governance systems, but problematic when used as a substitute for capability the owner does not possess.

Mongolia: structural constraints of a frontier market

Mongolia is perhaps the clearest illustration in Asia-Pacific of the limits of contractual risk transfer within a frontier market environment. Utility-scale renewable energy projects are technically achievable and have been delivered successfully, yet their execution frequently depends upon a broad ecosystem of international participants rather than on local delivery capability alone.

Projects are commonly dependent upon imported equipment, international OEMs, foreign consultants, multilateral development institutions and specialist technical advisers. Under such conditions, a wrapped EPC contract may simplify contractual interfaces without simplifying the project itself. Many critical project outcomes continue to depend upon participants operating outside the contractor's direct control.

This distinction is important because it exposes a structural tension within frontier markets. The procurement model that owners often most desire is the one that the market is least able to supply. Sponsors frequently seek a single counterparty capable of integrating all project risks, yet genuine integration capability is constrained by the availability of experienced personnel and specialist expertise.

Under these conditions, project success is increasingly determined by the quality of governance systems surrounding the project rather than by contractual form itself. The owner's engineer, lender's technical adviser and experienced international project leadership frequently become critical participants in project delivery rather than supplementary support functions.

Mongolia therefore reinforces a broader proposition advanced throughout this commentary. Frontier markets do not reduce the importance of procurement structures, but they do alter their effectiveness. The practical limits of contractual risk transfer become more visible because capability itself is often an

[26] Masdar. (2023). *Cirata Floating Photovoltaic Power Plant Project Overview*. https://masdar.ae/en/renewables/our-projects/cirata-floating-photovoltaic-fpv-plant

imported resource. Projects succeed not because risks have been fully transferred, but because organisations have assembled the expertise required to manage them. In this context, highly experienced project personnel and advisers should not be regarded as contingency measures deployed after problems emerge, but as integral components of project governance established before procurement commences and throughout the project lifecycle. [27]

The successful delivery of projects such as the 50 MW Salkhit Wind Farm, the 50 MW Tsetsii Wind Farm and the 55 MW Sainshand Wind Farm demonstrates that frontier market conditions are not barriers to success, but they do require substantial international collaboration and independent technical oversight.

South Korea: stakeholder complexity cannot be solved through procurement structures

South Korea demonstrates that sophisticated contractor markets do not eliminate project delivery risk. The country possesses deep industrial capability, world-class engineering expertise and a mature supply chain, particularly in support of its growing offshore wind ambitions. Yet project delivery remains challenging because institutional complexity and stakeholder management have become increasingly important determinants of project outcomes.

Offshore wind is among the most integration-intensive renewable technologies currently being deployed. Projects require the coordination of turbine OEMs, foundation contractors, marine installation specialists, cable contractors, environmental regulators, fisheries stakeholders, local governments and grid operators, all operating within separate regulatory and contractual frameworks.

Under these conditions, no procurement structure can fully absorb consenting or stakeholder risks that arise from statutory processes. Even highly capable EPC contractors possess limited authority over environmental approvals, fisheries consultation requirements and inter-agency coordination processes.

South Korea therefore demonstrates an important proposition advanced throughout this commentary: contractor capability and institutional complexity are distinct variables. A sophisticated contractor market does not neutralise stakeholder risk. Successful projects increasingly depend upon governance systems that align diverse participants toward a common outcome rather than upon any individual organisation acting as a single point of responsibility.

The experience of the 8.2 GW Sinan Offshore Wind programme, which has encountered extensive stakeholder engagement and consultation requirements, illustrates the growing importance of non-construction activities in determining project outcomes.

This observation is consistent with the proposition that successful projects operate as “a single, determined organism”. [28] In South Korea, project outcomes are increasingly determined by an organisation’s ability to coordinate multiple stakeholders rather than by its ability to construct physical infrastructure alone.[29]

[27] Flyvbjerg, B. and Gardner, D. (2023) pp 98-99.

[28] Flyvbjerg, B. and Gardner, D. (2023). pp 145-157

[29] Pondera. (2024). ‘*Navigating Korea’s offshore wind regulations: Challenges and way forward*’ (Final Public Executive Summary, EU Climate Dialogues Project), pp. 1-6. https://www.eeas.europa.eu/sites/default/files/documents/2024/ROK03%20Final%20Public%20Executive%20Summary%20v2.0.pdf

The Philippines: external dependencies as the critical path

The Philippines demonstrates an emerging characteristic of renewable energy project delivery throughout Asia-Pacific: projects are becoming progressively more dependent upon activities that occur outside their immediate boundaries. The country's archipelagic geography, evolving regulatory environment and accelerating renewable energy ambitions have created a project environment in which successful delivery increasingly depends upon the coordination of multiple external stakeholders.

Mechanisms such as the Green Energy Auction Program have successfully accelerated investment, yet project outcomes frequently remain influenced by factors that sit beyond the authority of any single participant. Permitting processes, land acquisition, environmental approvals, utility coordination and stakeholder engagement all materially influence project schedules and commercial outcomes.

This distinction has important implications for procurement. Renewable energy projects are becoming less self-contained assets and more integrated systems whose performance depends upon numerous independent participants operating under separate contractual and regulatory frameworks. Under these conditions, the traditional notion of a single point of responsibility becomes increasingly difficult to sustain in practice.

The Philippines therefore reinforces a broader proposition advanced throughout this commentary. Procurement structures should not assume that third-party dependencies can be fully transferred to contractors through contractual mechanisms alone. Rather, successful projects increasingly rely upon sophisticated governance systems, experienced owner's teams and well-resourced advisers capable of coordinating activities that extend beyond project boundaries. As renewable energy projects become more interconnected, governance capability is becoming a more reliable predictor of success than procurement structure itself.

The Philippines also demonstrates the growing divergence between contractual accountability and practical control. Sponsors may engage an EPC contractor expecting a single point of responsibility, yet project outcomes frequently depend upon decisions made by organisations that sit entirely outside the contractual chain. The distinction is increasingly important because disputes often arise not from deficiencies in construction, but from differing expectations regarding who was responsible for managing external dependencies.

> *Across all six markets the pattern is consistent. The decisive variable is not the contract but the alignment of capability, institutions and people with the model chosen. Different markets require different solutions, and the diversity of the region is a reason for tailored procurement, not for a single preferred form.*

Jurisdiction	Procurement Lesson
Australia	Integration complexity despite a mature contracting market
Vietnam	Compressed development cycles which appear likely to continue
Indonesia	Owner capability and integration challenges
Mongolia	Limits of contractual risk transfer
South Korea	Stakeholder complexity
Philippines	External dependencies

Table 2. The dominant procurement lesson from each jurisdiction. No single model travels unchanged across the region.

7. Why Delivery Structures Are Becoming More Litigious

The growth of renewable energy across Asia-Pacific is changing the character of disputes. Infrastructure disputes once centred on engineering failures such as defective concrete, structural defects, equipment malfunction, and workmanship. Those disputes still occur, but they no longer dominate. Increasingly, disputes originate in integration failures, and the shift is significant: technical quality has improved while project complexity has risen faster, leaving a widening gap between contractual structures and project realities. International users continue to rate arbitration the preferred mechanism for cross-border energy and construction disputes.[30]

What the institutional data shows

The major arbitral institutions confirm that construction, engineering and energy disputes are not a marginal category but a core part of international caseloads. At the International Chamber of Commerce, 841 new arbitrations were registered in 2024, carrying an aggregate amount in dispute of new cases around US$102 billion, with the year-end pending caseload reaching roughly US$354 billion. Construction and engineering accounted for 23.2% of new cases and energy for a further 20.5%, together about 44% of all new filings, and 69% of cases were cross-border.[31]

The picture is consistent across the region's leading seats. The Singapore International Arbitration Centre recorded its highest ever total sum in dispute alongside its second-highest caseload in 2025 (due to a substantial spike in 2020). 2025 saw 886 new cases totalling USD 14.53 Bn across 79 jurisdictions, with an average value of USD 32.18 million for all new SIAC administered case filings, and the highest single administered case value was USD 3.93 billion.[32] The Hong Kong International Arbitration Centre received 388 new arbitration filings in 2025 (within 582 new cases overall) across 61 jurisdictions, a 10.2 per cent increase on the 352 arbitrations recorded in 2024. The total amount in dispute across all its arbitrations rose to a record HKD 126.2 billion (approximately USD 16.2 billion), up from HKD 106 billion (approximately USD 13.6 billion) in 2024.[33]

The Australian institution tells the same story at smaller scale and with a sharper sectoral signal. The Australian Centre for International Commercial Arbitration reported 54 administered matters and 25 new filings in 2024, with the quantified caseload exceeding A$3.315 billion, up from A$2.1 billion a year earlier. Construction led at 30.8% and energy contributed a further 15.4%; Sydney was the seat in 69%

[30] Queen Mary University of London & White & Case. (2025). '*International Arbitration Survey*.' School of International Arbitration, QMUL, London. https://www.whitecase.com/sites/default/files/2025-10/white-case-qmul-international-arbitration-survey-report-2025.pdf

[31] International Chamber of Commerce. (2025). '*ICC Dispute Resolution 2024 Statistics*.' ICC, Paris. https://iccwbo.org/wp-content/uploads/sites/3/2026/06/2026_ICC_DRS_Statistics_EN.pdf

[32] Singapore International Arbitration Centre. (2026). '*SIAC Annual Report 2025*.' https://jusmundi.com/en/document/pdf/publication/en-siac-singapore-international-arbitration-centre-annual-report-2025 See also Herbert Smith Freehills Kramer, (2026) SIAC Annual Report 2025: Key Statistics, Trends and Takeaways for International Arbitration Practitioners, https://www.hsfkramer.com/notes/arbitration/2026-5/siac-annual-report-2025-key-statistics-trends-takeaways-for-international-arbitration. Notably, construction represented 9 per cent of SIAC arbitrations in 2025.

[33] Hong Kong International Arbitration Centre. (2026). '*HKIAC 2025 Statistics*'; HKIAC. (2025). '*HKIAC 2024 Statistics*.' https://hkiac.org/about-us/statistics/. Notably, construction represented 9.2 per cent of HKIAC arbitrations in 2025.

of new matters, and 46% involved at least one non-Australian party. The notable feature is the eleven expert appointments among the new filings, a reminder that technically complex energy disputes increasingly turn on expert evidence.[34]

Two points follow for delivery. First, construction and energy disputes are structurally significant and rising in value, so the cost of getting delivery governance wrong is large and increasingly likely to be tested in arbitration. Second, the disputes that now reach tribunals are less about isolated defects and more about how complex, multi-party projects were governed, precisely the integration questions this commentary has addressed.

Disputes are increasingly multi-causal

Renewable disputes rarely have a single cause. A delay may combine OEM slippage, transmission delay, an owner decision, a regulatory approval and adverse weather. Each event may appear manageable in isolation, collectively they become significant, and simple causation analysis is inadequate. Concurrent delay is becoming one of the defining legal issues of regional renewable projects, because multiple parties influence outcomes simultaneously, and its analysis requires disciplined, contemporaneous programming evidence of the kind the Society of Construction Law protocol contemplates.[35]

A related pattern is the accumulation of what may be termed integration debt. By analogy with technical debt in software engineering, integration debt arises where unresolved interface issues are deferred rather than closed out, on the assumption that they can be reconciled later. The debt remains largely invisible during procurement and early construction and crystallises during commissioning and energisation, frequently as simultaneous claims over delay, performance and the commercial operation date. Projects carrying significant integration debt tend to experience not a single dispute but several at once, because the deferred interfaces fail together.

Integration failures are replacing construction failures

The dominant dispute trigger is shifting from construction risk to integration risk. Grid operator delays, OEM coordination failures, software and protection-system changes, transmission constraints and regulatory amendments. These issues do not fit neatly within traditional contractual boundaries, so responsibility becomes contested. Forensic analyses of capital project claims point to the same recurring causes. The 7th Annual HKA CRUX Insight 'Changing the Narrative' suggests that poor contractor / supplier management and interface failures account for 17.9% of the top global causes of claims and disputes, with Asia reporting 19.8%. HKA also refer to a high prevalence of third-party conflicts due to infrastructure projects becoming increasingly complicated by multifaceted interfaces.[36]

[34] Australian Centre for International Commercial Arbitration. (2025). '*ACICA 2024 Case Statistics*.' ACICA, Sydney. https://acica.org.au/wp-content/uploads/2026/06/ACICA-Releases-Statistics-for-2025.pdf

[35] Society of Construction Law. (2017). '*Delay and Disruption Protocol (2nd ed.)*.' SCL, Hinckley, UK. https://www.scl.org.uk/sites/default/files/documents/SCL_Delay_Protocol_2nd_Edition_Final.pdf

[36] HKA. (2024). '*Changing the narrative: An analysis of claims and dispute causation on engineering and construction project's* (Seventh annual CRUX Insight report), p8,24.

Renewable energy disputes are becoming systems disputes

Taken together, these shifts change what a tribunal is asked to decide. The question is increasingly whether a complex system performed as intended, rather than whether a single party discharged an isolated obligation. The inquiry is less whether a contractor poured defective concrete and more whether dozens of participants collectively achieved integration. The evidentiary burden changes accordingly: contemporaneous records, interface registers and programme controls become more probative than any individual technical document, and the party that maintained them is usually the party that prevails.

Dispute profiles differ by model

The procurement model shapes the dispute profile. EPC disputes tend to be fewer but larger. Delay and extension-of-time claims, variations arising from scope development or geotechnical conditions, liquidated-damages claims where the commercial operation date becomes unattainable through third party events, and performance guarantee disputes over turbine availability, battery degradation or output. Multi-contracting produces the inverse profile. Disputes that are smaller but more numerous, such as interface ownership, concurrent delay, coordination, scope overlap and information transfer. These are administratively intensive rather than technically complex, and they reward strong governance systems over clever drafting.

International infrastructure governance guidance increasingly recognises that projects evolve over time and that contracts should accommodate this reality. The OECD recommends balanced contractual relationships and transparent mechanisms for contract renegotiation and dispute resolution that account for changing conditions over the asset life cycle,[37] and this is particularly relevant for renewable energy projects, where technology evolution, grid integration requirements and regulatory changes may fundamentally alter assumptions that existed at financial close.

Tiered resolution and standing dispute boards

The structure of the dispute resolution mechanism is itself a delivery decision, not merely a drafting one. The standard FIDIC forms contemplate a tiered process. Engineer or party determination, a dispute avoidance and adjudication board, amicable settlement, then arbitration, and on long, interface-heavy renewable programmes the value of a standing dispute board is considerable. A board that has followed the project in real time can address interface and delay questions while the contemporaneous record is fresh and relationships remain workable, rather than years later before a tribunal reconstructing events from documents. The discipline is consistent with the resourcing thesis of this commentary: the same investment in records, programme controls and experienced people that makes delivery governable also makes early, proportionate dispute resolution possible. Where parties defer the mechanism until a dispute has crystallised, they forfeit the cheaper remedies and are left only with the most expensive one.

[37] OECD. (2025). II iii) g).

Experts are becoming more important

The changing nature of disputes is changing expert requirements. A single engineering expert was once sufficient; modern disputes increasingly demand several disciplines. Power-systems and transmission engineering, battery systems, programming and quantum analysis, and regulatory expertise, because tribunals are being asked to understand systems rather than isolated events. The independence and procedural standards that govern expert evidence are accordingly central, and the established international frameworks (such as the IBA Rules on the Taking of Evidence in International Arbitration) for evidence and for conflicts of interest are the reference points practitioners should expect tribunals to apply.[38]

Underpinning all of this is the enforceability architecture that makes arbitration the default for cross-border energy work. The UNCITRAL Model Law, adopted in various forms across the region's seats,[39] and the New York Convention, which secures recognition and enforcement of awards across more than 170 states.[40] For owners and contractors alike, the practical message is that delivery governance and dispute readiness are the same discipline observed at different moments. The records, interface registers and programme controls established during delivery are precisely the evidence on which any subsequent dispute will turn.

8. Practical Recommendations

Several practical observations follow from the analysis. They are not novel, and that is the point. The disciplines that protect projects are well known and inconsistently applied. Each is a resourcing decision as much as a contractual one.

Recommendation 1: Invest more in front-end engineering

Projects consistently underinvest in front end engineering design, treating it as a cost to be minimised rather than the cheapest risk reduction available. The most valuable dollar is often spent before procurement, because scope maturity at award determines how much risk any contract can genuinely allocate. A premature procurement decision cannot be repaired by contractual drafting.

Recommendation 2: Interrogate programmes rather than accept them

Programmes should not be accepted at face value. The assumptions that matter such as weather windows, transmission availability, permitting timelines and OEM delivery slots should be challenged and stress-tested before award. Optimism is not a strategy, and an unrealistic baseline programme is the single most reliable precursor of a delay dispute.

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[38] International Bar Association. (2020). '*IBA Rules on the Taking of Evidence in International Arbitration*.' IBA, London. https://www.ibanet.org/MediaHandler?id=def0807b-9fec-43ef-b624-f2cb2af7cf7b

[39] United Nations Commission on International Trade Law. (2006). '*UNCITRAL Model Law on International Commercial Arbitration (1985, with 2006 amendments)*. 'United Nations, Vienna. https://uncitral.un.org/sites/default/files/media-documents/uncitral/en/19-09955_e_ebook.pdf

[40] United Nations. (1958). '*Convention on the Recognition and Enforcement of Foreign Arbitral Awards*' (New York Convention). United Nations, New York. Currently there are 172 contracting states. https://uncitral.un.org/sites/default/files/media-documents/uncitral/en/06-54671_ebook.pdf

Recommendation 3: Evaluate individuals, not just organisations

Because capability resides in people, diligence should identify the project director, construction manager and commissioning manager who will actually be deployed, and should secure their continuity where possible. A strong corporate record carried by individuals who are not assigned to the project is of limited value.

Recommendation 4: Build a genuine owner's engineering and management function

The owner's engineering and management function should be resourced as a strategic risk management function, not an administrative observer, with real depth in technical oversight, commercial administration, grid integration, stakeholder management and programme controls. Where in-house depth is absent, it should be supplied through retained third-party advisers. This is the control that makes every other recommendation effective.

Recommendation 5: Resource dispute avoidance from notice to proceed

Dispute avoidance is far cheaper than dispute resolution. Contemporaneous records, interface registers, decision logs and periodic programme audits should be established at notice to proceed, not assembled after a dispute emerges. The same records that govern delivery are the evidence on which any later claim will be decided.

Recommendation 6: Select the model according to capability

Before fixing a procurement strategy, four questions should be answered honestly: Is the scope sufficiently mature? Is genuine contractor integration capability available in this market? Does the owner possess, or can it retain, the capability to integrate? Can lenders support the proposed structure? Where any answer is unsatisfactory, the strategy, or the resourcing behind it, should be reconsidered before award rather than after.

9. Conclusion

The renewable energy industry has become preoccupied with procurement structures. The preoccupation is understandable, because contracts are tangible and capability is not. Yet experience across Asia-Pacific suggests that capability, not contractual form, is the decisive variable. The fundamental question is not whether to use EPC wrap, turnkey lump sum or multi-contracting, it is which organisation is best equipped to manage integration risk, and whether it has been resourced to do so.

That question will only grow in importance. The transition is producing assets that are more interconnected, more technologically sophisticated and more dependent on third-party infrastructure than the generation that preceded them. Complexity has itself become a project risk. Many disputes are not evidence of incompetence, they are evidence of systems that have become difficult to govern. The APAC region's extraordinary diversity means no single procurement model can be applied universally. Different markets, owners and projects require different structures, and that should be regarded as a feature of the region, not a defect.

The objective is not to identify a universally superior model. It is to align each project with the capabilities available to govern it, and to resource any gap with experienced personnel and competent third-party advisers before procurement rather than after dispute.

Renewable projects are not delivered by contracts, they are delivered by people. Contracts remain critically important, but they are instruments of governance, not substitutes for it. Risk does not disappear because it is written into another party's contract, it stays embedded in the project and ultimately resides with whichever organisation is most capable of controlling it.

The projects that perform best over the next decade will not necessarily be those with the most sophisticated contracts. They will be those that most accurately align contractual structure, institutional reality and human capability. That alignment, more than contractual form, is likely to become the defining characteristic of successful renewable energy delivery across Asia-Pacific.

Renewable energy projects are increasingly systems-integration projects, and procurement structures are simply alternative governance systems through which integration risk is allocated. In Asia-Pacific, successful delivery is becoming less a question of what was written into the contract and more a question of who possessed the capability to make the contract function.

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