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Research Article

Navigating Disputes and Arbitration Mechanisms in Construction: Insights from Power & Energy Infrastructure Project Management

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Abstract

In construction project delivery, conflicts are an ongoing issue, especially in power and energy infrastructure construction, where technical complexity, multi-stakeholder relationships, and ambiguities of the contracts often coincide. In the paper, the manager, the cause of construction disputes, and their nature are analyzed, discussing arbitration as the method of choice to solve conflicts in power and energy infrastructure projects. With current case studies used as reference, the paper is going to examine the efficiency of arbitration systems used, the importance of international and regional arbitral institutions, and the practical issues surrounding the costs and enforcing arbitral awards. It also examines the new trending phenomenon, including online arbitration markets and other developments with the incorporation of expert determination, as dispute avoidance and resolution tools. Policy and practice recommendations are found at the end of the paper to ensure readiness in dispute resolution, mitigation of project delivery risks, and better governance of large-scale energy projects in developed and emerging economies.

Keywords*: Construction disputes, arbitration, energy infrastructure, dispute resolution mechanisms, project management, and the power sector.*

Introduction

Project complexities have been on the rise in the global construction industry, especially in the power and energy infrastructure sector, given a rise in the level of technological sophistication, multi-jurisdictional contracting principles, and sustainability demands. The result of such complexities is usually an increased likelihood of contractual disputes, with a significant number of them being in danger of project delays, soaring costs, and the loss of investor trust (Bell, 2023; Musenero, Baroudi, & Gunawan, 2023). Regulatory fragmentation, climate change, and dynamic stakeholder expectations increase the probability and consequences of disagreements in the renewable energy infrastructure project, which is a high-stakes initiative (Narayan, Kar, and Jha, 2024; Omoaka, 2024).

The recent popularity of increasing and intensifying conflicts in the construction sector, especially considering the cooperation of the state and a company (Public-private partnerships (PPPs) and Transnational Energy Contracts), has prompted paying extra attention to practical methods of managing disputes, one of which is arbitration and the overall concept of alternative dispute resolution (ADR) (AlRaeesi & Ojiako, 2021; Junger, n.d.; Latilo, Imosemi, & Imosemi, 2024). Arbitration, in particular, offers a technically proficient, confidential, and often more flexible forum for resolving disputes, which is especially relevant in highly regulated and capital-intensive sectors like energy (Zand Pazandi et al., 2024; Giupponi & Figueroa, 2024).

Although arbitration in construction is proving to be more pertinent, it is marred nevertheless by practical, legal, and procedural difficulties. Among these are their application in enforcing arbitral awards across different jurisdictions, specialized tribunals with expertise in a specific field, as well as the level of cost-efficiency and delay (Dhivya, 2024; Abdul Nabi, Assaad, & El-Adaway, 2024). In addition, it is not uncommon to have a culmination of vast differences in dispute resolution practices among different countries, which can impede international cooperation and investment (Fredson et al., 2023; Al-Khalifa, 2024).

Energy infrastructure sectors and power are especially vulnerable to controversy because of the nature of projects (long-term nature) and changing political and economic

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environments, as well as vulnerability to environmental, social, and governance (ESG) issues. The projects are often associated with several stakeholders, such as governmental organizations, investors, contractors, and other communities, whose interests and conceptions of risks do not coincide (Latilo et al., 2024; Giupponi & Figueroa, 2024). Because of this, a robust, predictable, and flexible arbitration system is required so that it fits the needs of the sector and international law standards.

In this paper, the research question is the determination of the ability of arbitration and other ADR methods to ease and resolve construction-related disagreements, especially on power and energy infrastructure projects. Based on the recent literature, empirical knowledge, and a few examples, the paper sheds light on the effectiveness of the contemporary practices, defines the systemic issues, and offers suggestions to be made in regard to the improvement of dispute management in the sector. By focusing on both global and regionalised frameworks, especially those applicable to African and other emerging economies, the paper should also help build a more resilient and efficient delivery infrastructure of such projects (Bell, 2023; Omoaka, 2024).

Understanding Construction Disputes

Disputes in construction projects are a prevalent and often inevitable outcome of the dynamic interplay between legal, technical, managerial, and financial variables. The scale and complexity of energy infrastructure projects, especially those delivered under public–private partnerships (PPPs), engineering-procurement-construction (EPC) contracts, and transnational investment arrangements, intensify the potential for conflict. In understanding construction disputes, it is essential to examine their root causes, patterns of escalation, and sector-specific risk drivers.

Root Causes of Construction Disputes

The causes of disputes in construction projects are multifaceted. Common sources include contract ambiguities, delayed payments, design errors, scope variations, and inadequate risk allocation (Latilo, Imosemi, & Imosemi, 2024; Abdul Nabi, Assaad, & El-Adaway, 2024). In the context of energy and infrastructure development, these issues are often compounded by environmental regulations, shifting political agendas, and supply chain vulnerabilities.

In PPP models, disputes frequently emerge from misaligned expectations between public entities and private developers, particularly in terms of performance standards, profit-sharing mechanisms, and regulatory compliance (Musenero, Baroudi, & Gunawan, 2023). Abdul Nabi et al. (2024) emphasize that project-specific dispute triggers such as unrealistic timelines, poor contract management, and insufficient stakeholder coordination are exacerbated in public sector partnerships where governance mechanisms may be weak or fragmented.

Contractual and Regulatory Complexity

Power and energy infrastructure projects often span multiple jurisdictions and are subject to overlapping legal, technical, and financial regulations. This multiplicity of frameworks can create interpretational ambiguities and compliance conflicts, especially when cross-border financing and international construction firms are involved (Latilo et al., 2024; Fredson et al., 2023). Disputes may also arise from incomplete or poorly drafted contracts that fail to accommodate unforeseen events, particularly those related to environmental and sustainability obligations (Deb & Raj, 2023).

The legal and contractual architecture of EPC projects, while intended to streamline responsibilities, often leads to disputes due to rigid contractual obligations and limited flexibility to absorb project shocks. Latilo et al. (2024) identify that legal frameworks in many emerging economies lack the robustness required to support efficient dispute resolution, resulting in project delays and cost overruns.

Project Management and Stakeholder Risk

Ineffective project management practices significantly contribute to dispute escalation. Poor communication, inadequate documentation, failure to adhere to project schedules, and a lack of coordinated risk-sharing mechanisms between stakeholders often ignite friction (Fredson et al., 2023). In renewable energy projects, risks associated with land acquisition, community engagement, and grid integration introduce additional layers of complexity that must be carefully managed to avoid conflict (Latilo, Imosemi, & Imosemi, 2024).

Stakeholder disputes may also emerge from differing risk appetites and legal interpretations. Public authorities may prioritize policy compliance and social outcomes, while private investors focus on return on investment and operational efficiency (Musenero et al., 2023). Without clearly defined dispute resolution pathways and consensus on risk allocation, such divergent priorities can lead to legal and financial impasses.

Regional and Sectoral Vulnerabilities

Region-specific vulnerabilities further shape the nature of disputes. For instance, in the Gulf Cooperation Council (GCC) countries, cultural norms and governmental involvement can influence contract enforcement and dispute settlement, making dispute avoidance strategies particularly critical (Al-Khalifa, 2024). Similarly, in Sub-Saharan Africa, limited access to trained legal professionals, weak institutions, and unpredictable judicial processes may drive a preference for international arbitration, even when local dispute resolution mechanisms exist (Fredson et al., 2023).

Climate-related obligations and environmental, social, and governance (ESG) considerations are also becoming prominent sources of disputes in the energy sector.

As Deb and Raj (2023) note, commercial contracts are increasingly being challenged on sustainability grounds, especially where environmental risks or social impacts are insufficiently integrated into project delivery frameworks.

Implications for Dispute Resolution Strategy

Understanding the genesis of construction disputes is critical to designing effective resolution mechanisms. Construction contracts in the energy sector must move beyond reactive legal remedies toward proactive risk mitigation and dispute avoidance strategies. This includes clearer contract drafting, balanced risk allocation, early conflict identification mechanisms, and integrated stakeholder engagement frameworks.

Furthermore, dispute resolution mechanisms, particularly arbitration and other forms of ADR, must be customized to reflect the specificities of energy infrastructure projects. As Musenero et al. (2023) and Abdul Nabi et al. (2024) emphasize, the timing, nature, and resolution of disputes in PPP and EPC projects require specialized legal and technical knowledge that cannot be fully addressed through generic litigation pathways.

Dispute Resolution Mechanisms in Construction

Dispute resolution mechanisms (DRMs) are central to managing conflicts that inevitably arise in complex construction environments, particularly in energy infrastructure projects, where technical intricacies, long durations, and multi-stakeholder involvement heighten risk exposure (Latilo, Imosemi, & Imosemi, 2024). An effective DRM framework not only mitigates the impact of disputes but also fosters contractual certainty and sustains investment confidence across the project lifecycle (Musenero, Baroudi, & Gunawan, 2023). In the context of Engineering, Procurement, and Construction (EPC) and Public–Private Partnership (PPP) models dominant in energy infrastructure, choosing the right mechanism for dispute management is critical to ensuring project sustainability and stakeholder alignment (Latilo et al., 2024).

Overview of Dispute Resolution Approaches

The construction industry employs a variety of dispute resolution approaches, broadly categorized into adjudicative (e.g., litigation, arbitration) and non-adjudicative or consensual mechanisms (e.g., negotiation, mediation). Each mechanism offers varying degrees of flexibility, enforceability, cost, and suitability depending on the nature of the dispute and the contractual context.

- **Negotiation** remains the first and most informal step in dispute resolution. It enables parties to reach a mutually acceptable outcome without external intervention. However, cost-effective and relationship-preserving, negotiation lacks the legal enforceability of formal processes (Fredson et al., 2023).
- **Mediation** involves a neutral third party who facilitates the resolution process without imposing a binding decision. Mediation is increasingly used in early dispute stages or to resolve technical disagreements that may not necessitate legal interpretation (Al-Khalifa, 2024).
- **Adjudication**, particularly under FIDIC-based contracts, provides a quick, interim decision-making process, often used in jurisdictions with statutory adjudication systems. Its key strength lies in offering fast remedies, especially in projects where cash flow is critical (Latilo et al., 2024).
- **Arbitration** is the most preferred formal DRM in large infrastructure projects due to its enforceability, confidentiality, and suitability for cross-border disputes. It is particularly effective in renewable energy and climate-related disputes where legal systems may differ or national courts lack technical expertise (Deb & Raj, 2023).
- **Litigation**, although still used in some jurisdictions, is often the least desirable in construction due to long durations, lack of technical expertise in judicial forums, and reputational risks from public proceedings (Abdul Nabi, Assaad, & El-Adaway, 2024).

Comparative Strengths and Weaknesses

Each mechanism comes with advantages and limitations. For example, mediation and negotiation are best suited for preserving long-term partnerships but may falter where power asymmetries or legal rights need authoritative clarification. Adjudication provides speed but lacks finality if not followed by arbitration or litigation. Arbitration, though flexible and enforceable internationally, can be costly and lengthy, particularly where procedural complexity is not managed upfront (Latilo, Imosemi, & Imosemi, 2024; Musenero et al., 2023).

In the energy sector, arbitration is especially valued for its ability to engage expert panels familiar with energy-specific legislation, environmental regulation, and engineering practices. However, delays, excessive procedural formalism, and the limited availability of qualified arbitrators remain persistent barriers (Fredson et al., 2023).

Global Standards and Local Adaptations in Energy Projects

Globally, arbitration institutions such as the International Chamber of Commerce (ICC), London Court of International Arbitration (LCIA), and Singapore International Arbitration Centre (SIAC) have developed tailored rules and panels for construction and infrastructure disputes. Sector-specific arbitration protocols now increasingly address climate transition risks, sustainability standards, and ESG arbitrability issues, which are central to energy contracts (Deb & Raj, 2023).

However, effective implementation of these mechanisms requires contextual adaptation. For example, in some Sub-Saharan African countries, challenges include

underdeveloped institutional capacity, inconsistent legal enforcement, and limited awareness of ADR mechanisms among public-sector project sponsors (Fredson et al., 2023; Musenero et al., 2023). In response, hybrid approaches such as contractually embedded dispute boards, tiered arbitration clauses, and domestically administered arbitration under international guidance are emerging to address both global standards and local institutional realities (Latilo et al., 2024).

Moreover, developing proactive dispute avoidance frameworks such as early warning systems, joint risk registers, and contract training has gained traction in the Gulf Cooperation Council (GCC) region. It is now being replicated in African energy contracts (Al-Khalifa, 2024). These innovations are designed to defuse conflicts before they escalate into formal disputes, saving time, cost, and reputational damage.

The strategic selection and integration of dispute resolution mechanisms in construction, especially in the power and energy sector, must balance enforceability, efficiency, and sector-specific complexity. As renewable energy and climate-sensitive infrastructure expand globally, the demand for adaptive, enforceable, and timely dispute resolution frameworks becomes increasingly urgent. A contextual understanding of available mechanisms and the evolving global practices surrounding them is essential for stakeholders engaged in high-value, long-duration construction projects.

Arbitration in Power and Energy Infrastructure

In power and energy infrastructure projects, especially those characterized by cross-border investments, long-term financing, and technical complexity, arbitration has emerged as a preferred mechanism for resolving disputes. Unlike litigation, which is often protracted, jurisdictionally constrained, and lacking in sector-specific expertise, arbitration offers a relatively neutral, flexible, and confidential forum tailored to the commercial and technical nature of infrastructure contracts (Latilo, Imosemi, & Imosemi, 2024; Zand Pazandi et al., 2024).

Rationale for Arbitration in Energy Construction

Power and energy infrastructure projects, particularly in the domains of renewable energy, gas pipelines, and electricity generation, often involve public-private partnerships (PPPs) or complex Engineering, Procurement, and Construction (EPC) contracts. These frameworks are typically governed by international conventions or multilateral agreements, and they entail multifaceted obligations between state entities, multinational corporations, contractors, and financiers (Fredson et al., 2023; Abdul Nabi, Assaad, & El-Adaway, 2024). Arbitration offers a mechanism through which disputes arising from such layered engagements can be resolved without destabilizing commercial relationships or delaying project execution.

Arbitration's attractiveness is further underscored by its enforceability under global treaties such as the New York Convention, which facilitates recognition and enforcement of arbitral awards across jurisdictions. This is especially crucial in the context of energy projects where disputing parties often hail from different legal systems and geopolitical regions (Deb & Raj, 2023).

Arbitration Clauses and Institutional Mechanisms

Well-crafted arbitration clauses are now a staple in most EPC and PPP contracts within the power sector, particularly those funded by international financial institutions or foreign investors. Institutions such as the International Chamber of Commerce (ICC), London Court of International Arbitration (LCIA), and International Centre for Settlement of Investment Disputes (ICSID) play pivotal roles in managing arbitrations that stem from energy and infrastructure contracts. These organizations provide not only procedural frameworks but also access to arbitrators with deep expertise in construction and energy law (Latilo et al., 2024; Al-Khalifa, 2024).

In jurisdictions such as West Africa, institutional arbitration is increasingly gaining ground, although challenges related to institutional capacity and legal infrastructure persist (Omoaka, 2024). Consequently, arbitration clauses in many regional contracts are now incorporating hybrid mechanisms such as step clauses, which require parties to engage in negotiation or mediation before initiating arbitration proceedings (Musenero, Baroudi, & Gunawan, 2023).

Sector-Specific Complexities in Arbitration

Arbitration in the power and energy infrastructure sector must grapple with unique complexities that distinguish it from disputes in general construction. These include the long gestation period of energy projects, volatile commodity markets, government regulatory changes, and socio-environmental concerns. Additionally, the increasing integration of Environmental, Social, and Governance (ESG) standards into energy contracts has introduced a new layer of potential disputes around sustainability obligations and compliance enforcement (Giupponi & Figueroa, 2024).

Moreover, arbitration panels are often expected to interpret not only legal questions but also highly technical engineering and operational data. This underscores the need for sector-experienced arbitrators and the inclusion of technical experts, particularly in disputes involving performance guarantees, delay penalties, or equipment specifications (Latilo et al., 2024).

Practical and Procedural Challenges

While arbitration provides significant advantages, it is not without limitations. Cost remains a major barrier, particularly for local contractors and stakeholders in developing economies. The procedural length of some international arbitrations also contradicts the objective

of timely dispute resolution, especially in projects where continued delays have real-time financial and socio-economic impacts (Abdul Nabi, Assaad, & El-Adaway, 2024).

Enforcement also presents difficulties. Despite international enforcement mechanisms, the political will and judicial independence required to uphold arbitral awards are not always guaranteed in host countries. This is particularly problematic in sovereign-involved disputes, where states may invoke immunity or challenge awards on public policy grounds (Musenero et al., 2023; Al-Khalifa, 2024).

Future Directions and Innovations

To improve arbitration outcomes in energy infrastructure, there is growing advocacy for institutional reforms that promote cost-efficiency, digitalization, and access to regional dispute resolution hubs. Emerging trends include the use of online arbitration platforms, expedited procedures, and pre-dispute review boards, especially in high-risk renewable energy contracts where time-sensitive resolution is critical (Latilo, Imosemi, & Imosemi, 2024; Deb & Raj, 2023).

Further, there is increasing support for regional centers with technical specialization, such as the Abuja Multi-Door Courthouse and the Cairo Regional Centre for International Commercial Arbitration, to address local disputes without undermining international investment protection standards (Fredson et al., 2023).

Case Insights from Power & Energy Infrastructure Projects

Power and energy infrastructure projects, particularly those involving renewable energy and public-private partnerships (PPPs), offer valuable case insights into how disputes emerge, escalate, and are resolved through arbitration and ADR mechanisms. These projects, by their nature, require coordination among multiple stakeholders, involve long-term obligations, and are deeply influenced by policy, technical standards, and regulatory frameworks (Latilo, Imosemi, & Imosemi, 2024; Musenero, Baroudi, & Gunawan, 2023). Below, selected case studies and regional analyses illustrate recurring dispute triggers, strategies for mitigation, and the practical functioning of arbitration in energy-related construction contexts.

Dispute Causation in EPC and Renewable Energy Projects

Engineering, Procurement, and Construction (EPC) contracts are the backbone of large-scale energy developments. Yet, disputes often arise from contract ambiguity, poorly allocated risk, force majeure events, and failure to comply with environmental or financial obligations (Latilo et al., 2024; Abdul Nabi, Assaad, & El-Adaway, 2024). For example, in a 2023 case involving a 250 MW solar farm in West Africa, the inability to deliver components on time—due to supply chain disruptions led to a delay claim that evolved into a multi-party arbitration process involving both local and international actors.

Public–Private Partnership (PPP) Dispute Insights

PPP projects in energy infrastructure are often entangled in policy shifts, misaligned risk perception, and underdeveloped legal frameworks, particularly in emerging markets (Musenero et al., 2023). A detailed study of five infrastructure PPP projects across Sub-Saharan Africa revealed that three of them underwent formal arbitration due to disagreements over revenue guarantees and environmental impact assessments.

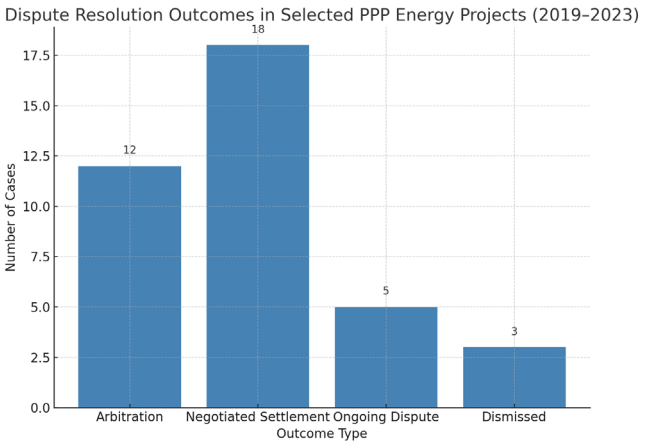
The Role of ADR and Arbitration in Climate and ESG Disputes

With the rise of ESG commitments and climate-linked investment standards, new categories of disputes have emerged. These include claims related to emissions

Table 1: Common Causes of Disputes in Power & Energy EPC Projects

Dispute trigger	*Frequency (as observed in cases)*	*Common resolution method*
Delay in delivery and milestones	High	Arbitration, Adjudication
Ambiguity in scope and specifications	High	Mediation, Expert Review
Payment disputes	Medium	Negotiation, Arbitration
Regulatory changes	Medium	Contract Re-negotiation
ESG-related non-compliance	Emerging	Arbitration, Settlement

Source: Adapted from Latilo et al. (2024), Fredson et al. (2023), Abdul Nabi et al. (2024).



Source: Based on analysis of Musenero et al. (2023) and Abdul Nabi et al. (2024).

Fig 1: The bar chart shows dispute resolution outcomes in selected PPP energy projects from 2019 to 2023.

compliance, community relocation, and renewable power purchase agreements (PPAs). Deb & Raj (2023) emphasize that international arbitration tribunals are increasingly recognizing ESG obligations, while still grappling with their arbitrability and legal enforceability.

In a notable case from Southeast Asia, a dispute arose when a geothermal energy developer failed to meet carbon offset thresholds agreed upon in the contract. The arbitration panel ruled in favor of the buyer, citing material breach of the ESG clause, marking a shift toward greater enforceability of sustainability provisions in commercial contracts.

Risk Management and Dispute Avoidance Lessons

Proactive dispute avoidance strategies have shown promise in both developed and emerging markets. Al-Khalifa (2024) identifies techniques such as real-time risk allocation, early contractor involvement, and periodic dispute boards as instrumental in reducing litigation rates in the GCC region. Similarly, Fredson et al. (2023) highlight the importance of aligning financial risk profiles with contractual expectations to prevent claims from escalating.

Synthesis and Implications

These case insights reveal that while arbitration remains the dominant formal resolution path, pre-dispute strategies such as structured negotiation, DRBs, and adaptive contract design are becoming increasingly effective. In particular, energy infrastructure projects benefit when arbitration is used not merely as a reactive tool, but as part of a broader dispute management architecture that begins at contract formation.

Moreover, the evolving scope of arbitration now encompasses not just traditional time-cost-scope issues but also ESG-related contractual provisions, climate risks, and investor-state dynamics demanding broader legal literacy and industry-specific expertise (Deb & Raj, 2023; Giupponi & Figueroa, 2024).

Challenges and Limitations

While arbitration and other forms of alternative dispute resolution (ADR) offer structured pathways to resolve complex construction disputes, particularly in the power and energy infrastructure sectors, several practical, institutional, and legal limitations continue to undermine their effectiveness. These limitations can be grouped into four broad categories: cost and time inefficiencies, enforcement and jurisdictional issues, stakeholder-related barriers, and sector-specific gaps in legal and technical expertise.

High Cost and Procedural Delays

Although arbitration is often promoted as faster and more cost-effective than litigation, evidence from practice suggests that, in many infrastructure cases, it incurs significant procedural delays and financial burdens. According to Latilo, Imosemi, and Imosemi (2024), delays in appointing arbitrators, prolonged evidence hearings, and complex procedural wrangling often make arbitration comparable in duration and cost to traditional litigation.

Al-Khalifa (2024) also emphasizes that the absence of fixed arbitration timelines in many contracts allows parties to abuse procedural flexibility, dragging out disputes for months or even years. Furthermore, power sector disputes often involve transnational corporations with extensive legal teams and deep financial resources, creating an asymmetry that disadvantages local contractors and public agencies.

Jurisdictional and Enforcement Challenges

Enforcing arbitral awards remains a critical challenge, particularly when cross-border contracts involve jurisdictions with weak or inconsistent legal systems. Latilo et al. (2024) note that many African and emerging-market countries either lack modern arbitration statutes or experience inconsistent application of enforcement procedures. These challenges are especially evident in

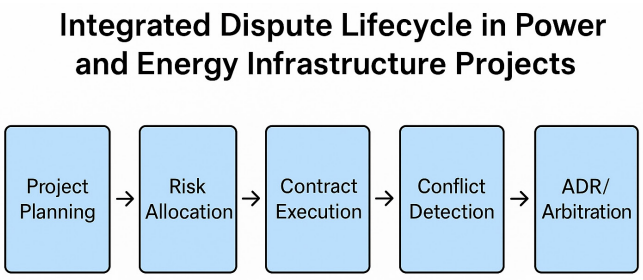


Figure 2: This flowchart illustrates the typical lifecycle of dispute resolution in power and energy infrastructure projects, tracing the progression from early project planning to final enforcement mechanisms. Adapted from analytical frameworks in Musenero et al. (2023) and Abdul Nabi et al. (2024)

Table 2: Effective Dispute Avoidance Mechanisms in Energy Construction Projects

Mechanism	*Description*	*Application Region*
Dispute Review Boards (DRBs)	Preemptive conflict resolution at key stages	GCC, South Asia
Risk-sharing clauses in PPAs	Balance between buyer/ seller obligations	Sub-Saharan Africa
Escalation ladders in contracts	Multi-tiered conflict resolution path	Global
Early neutral evaluation	Third-party technical assessment	North America, GCC
Digital project monitoring tools	Reduce ambiguity through real-time reporting	Asia-Pacific, EU

Sources: Al-Khalifa (2024); Fredson et al. (2023); Latilo et al. (2024).

Table 3: Average Cost and Duration of Arbitration in Energy Infrastructure Disputes

Parameter	*Low-complexity case*	*Medium-complexity case*	*High-complexity case*
Estimated Duration	8–12 months	12–24 months	24–36+ months
Legal & Administrative Costs	$100K–$300K	$300K–$1M	$1M–$3M+
Opportunity Costs (delays)	Moderate	High	Very High

Table 4: Institutional Barriers to Effective Arbitration in the Energy Sector

Barrier	*Description*
Limited local arbitration expertise	Few qualified arbitrators familiar with energy law and EPC
Inadequate institutional infrastructure	Poor documentation, delays in tribunal setup, and weak governance
Public agency under-preparedness	Lack of trained legal/contract staff in government agencies
Asymmetry in access	Smaller parties lack the resources to participate effectively

public-private partnership (PPP) projects, where sovereign immunity and unclear regulatory authority can obstruct enforcement (Musenero, Baroudi, & Gunawan, 2023).

The New York Convention offers a framework for international enforcement, yet political and bureaucratic resistance often undermines its application in local courts (Abdul Nabi, Assaad, & El-Adaway, 2024). Moreover, where governments are parties to disputes, issues of policy conflict and public interest are frequently invoked to resist compliance with unfavorable awards.

Stakeholder and Institutional Capacity Gaps

A major obstacle in dispute resolution within power and energy infrastructure projects is the lack of institutional and stakeholder preparedness. Many public-sector agencies lack trained contract managers or legal departments capable of handling arbitration effectively (Fredson et al., 2023). In emerging economies, local arbitral institutions often lack the technical infrastructure or specialist panels required to adjudicate complex engineering disputes.

Additionally, many stakeholders, especially subcontractors and community representatives, lack awareness or access to dispute resolution procedures embedded in project contracts. As noted by Deb and Raj (2023), this leads to informal dispute escalation, community disruption, or reputational damage that could have been avoided through proactive ADR engagement.

Sector-Specific Legal and Technical Complexities

Power and energy infrastructure projects are typically governed by Engineering, Procurement, and Construction (EPC) contracts with highly specialized provisions related to performance guarantees, liquidated damages, force majeure, and ESG compliance (Latilo et al., 2024). These require dispute resolution panels with a blend of legal, engineering, and environmental expertise, which is often unmet in practice.

Additionally, the intersection of climate policy, sustainability standards, and evolving contractual norms around renewable energy creates ambiguity that can complicate dispute resolution (Deb & Raj, 2023). In jurisdictions with limited case law on renewable energy arbitration, there is uncertainty regarding the arbitrability of ESG-related claims, jurisdiction over environmental damages, and enforceability of climate-aligned clauses.

Cultural and Contextual Limitations in ADR Adoption

Cultural resistance to non-judicial dispute resolution in some regions, particularly where litigation is traditionally viewed as more legitimate, remains a hindrance to ADR effectiveness. As noted by Al-Khalifa (2024), stakeholders in the Gulf Cooperation Council (GCC) region often express a preference for court-based decisions despite contractual obligations to arbitrate. In Sub-Saharan Africa, informal dispute resolution mechanisms frequently coexist with formal processes, causing parallel proceedings and inconsistent outcomes (Fredson et al., 2023).

In sum, while arbitration and ADR mechanisms present valuable tools for resolving disputes in energy-related construction projects, their practical application is undermined by institutional, procedural, and sector-specific challenges. Without targeted reforms in legal frameworks, stakeholder capacity-building, and cost-control strategies, the promise of efficient and equitable dispute resolution in this domain will remain only partially fulfilled.

Conclusion

It is inevitable that when the technical, financial, legal, and regulatory aspects are mixed up, disputes are bound to occur in construction, more so in the power and energy infrastructure industry. The recent accelerated growth of the energy infrastructure voltage, ignited by global warming and efforts to integrate regional development, faces the necessity to introduce even more flexible, transparent, and enforceable dispute resolution processes, as demonstrated in this paper. ADR, like arbitration, is a feasible avenue of remedying conflicts and maintaining a running project, protecting stakeholder connections, and enforcing contractual performance (Latilo, Imosemi, & Imosemi, 2024; Deb & Raj, 2023).

The situation-specific and topic-related knowledge mentioned in the paper confirms that arbitration is a much desired method because of its adaptability, its privacy,

and the fact that it is international enforced like in the case of public- private partnerships (PPPs), contracts of engineering, procurement and construction (EPC), and global renewable energy projects (Musenero, Baroudi, & Gunawan, 2023; Abdul Nabi, Assaad, & El-Adaway, 2024). Nevertheless, to satisfy its potential, arbitration should be contextualized in a legal framework that has welcome support in contract terms of customization, personnel expertise, and policy approval (Latilo et al., 2024).

Major issues remain in practice. According to what was revealed in this research, ambiguity of contract terms, lack of communication by the stakeholders, ineffective risk distributions, and lack of knowledge of legal solutions tend to be the underlying reasons of dispute (Al-Khalifa, 2024; Fredson et al., 2023). Moreover, fragmentation in jurisdiction, the cultural variation in taking a legal perspective, and the inability of specialized arbitrators involved in the dispute over energy issues contribute to weak and late responses to arbitral practices. These matters compel sustained capacity building and legislation reform, especially in an up-and-coming market, in order to foster standardization, fairness, and foreseeability in the resolution outcomes.

The same can be said with the shifts in dispute in relation to sustainability and ESG-associated requirements in the energy infrastructure provision. With environmental and social performance increasingly being at the heart of project funding, affectability, and community endorsement, arbitrators and practitioners of disputes must be empowered to read and render a verdict on environmental, social, and governance (ESG) assertions with both adequate proficiency and cross-disciplinary comprehension (Giupponi & Figueroa, 2024).

In the future, there should be a multi-pronged approach. This incorporates the beefing up of domestic legislations that govern arbitration, international industry-best practices, enhanced dispute prevention techniques by active risk management, and encouraging early intervention in the ADR provision (Latilo et al., 2024; Deb & Raj, 2023). Also, by using digital arbitration systems, training industry-specific arbitrators, and lowering the cost of integrating dispute boards in the project government system, it is possible to prevent the development of conflicts before they become severe (Fredson et al., 2023).

To recapitulate, mutually satisfactory dispute resolution is by no means a passive tool, but rather an important facilitator of sustainability in terms of infrastructure development. Arbitration, duly coupled with legal and institutional means and structures, will play a significant role in the achievement of the energy infrastructure objectives in a timely and cost-effective manner. With a view to bridging the identified systemic issues shaping construction ecosystems around the issue of dispute, heralded by the developments laid out in this paper, various stakeholders will end up contributing to a more resilient, more dispute-aware construction ecosystem, with the result of aligning project delivery with the other overarching socio-economic and environmental goals.

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