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Article Title

Harmonization of Electricity Construction Claim Prevention Mechanisms: Integration of Pre-Construction Documents, FIDIC Standards, and Standing Dispute Boards

Author(s)

Junaedi Junaedi*
Universitas Pekalongan, Indonesia || junaedi.mas@gmail.com
**Corresponding Author*

Reza Rafly Sebastian
Universitas Pekalongan, Indonesia || rezza.rafly@gmail.com

Eko Rahmiko
Universitas Pekalongan, Indonesia || ekorahmiko.73@gmail.com

Riko Yanuar
Universitas Pekalongan, Indonesia || rkyan.jkt@gmail.com

Sarwono Hardjomuljadi
Universitas Pekalongan, Indonesia || sarwonohm2@yahoo.co.id

S. Sami'an
Universitas Pekalongan, Indonesia || dosen.samian@gmail.com

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ABSTRACT

Construction disputes in national strategic electricity projects often hinder cost and time efficiency. This problem is fundamentally rooted in pre-construction document uncertainty and the regulatory gap between national contracts and international standards. This research aims to analyze the juridical implications of incomplete Employer's Requirements documents on claim validity. It also evaluates gaps in notification mechanisms and differences in work between SOE contract standards and the FIDIC Silver Book, and constructs a dispute-prevention harmonization model. The research method used is normative legal research, with statutory, comparative, and case approaches, applied to the Asahan 3 HEPP project. The results show that disputes in the execution phase are residues of errors in concept design in the pre-construction phase. This condition creates information asymmetry and injures the principle of good faith. Comparative analysis reveals significant gaps in variation and substantiation procedures. Bureaucratic rigidity in national contracts due to the disharmony between Law Number 2 of 2017 and the state finance regime hinders rapid resolution compared to the FIDIC early warning system. However, empirical evidence shows that SDB activation can effectively mitigate conflict escalation. The research concludes that the ideal harmonization model must transform the paradigm from dispute resolution to dispute prevention. This is achieved by integrating SDB institutionalization with the validity of BIM digital data as indisputable primary evidence. This step is necessary to guarantee legal certainty and the sustainability of national strategic projects.

Keywords: *Claim Prevention; Electricity Projects; FIDIC Silver Book; Pre-Construction Documents; Standing Dispute Board.*

INTRODUCTION

The development of electricity infrastructure serves as the backbone of national energy sovereignty. This sector plays a vital role in supporting economic growth and social welfare. Given their strategic and high-risk nature, these infrastructure projects are generally executed through complex Engineering, Procurement, and Construction (EPC) contracts. In this scheme, the allocation of risks, costs, and schedules is strictly regulated. However, reality shows that these projects are often hampered by construction disputes that have systemic impacts. Global and regional studies indicate that construction claims are a universal phenomenon that significantly erodes project cost and time efficiency. This phenomenon occurs across contexts, from developing countries in Africa to infrastructure projects in Asia and Australia (Rahnamayiezekavat et al., 2022; Okereke et al., 2023). In the context of Indonesian construction law, this phenomenon is not merely a technical issue. It reflects an imbalance in legal relationships that often begins in the pre-construction phase due to a lack of understanding regarding the urgency of contractual risk management (Cruz & Polinar, 2023; Pasinggi & Simanjuntak, 2024).

One of the root causes that often escapes attention is the quality of pre-construction documents, specifically the Employer's Requirements, which form the basis of the engagement. In many cases, incompleteness and ambiguity in tender documents create information asymmetry between the Employer and the Contractor. Lee et al. (2021) found, through text analysis of construction law cases, that contractual

language ambiguity is a primary predictor of disputes. This situation is exacerbated by a common reality in national power plant projects: the forced signing of contracts when planning documents are not fully mature, to meet operational targets. Juridically, this condition potentially violates the principle of good faith (*asas itikad baik*) in contracting (Nugroho & Hardjomuljadi, 2022). This complexity is further increased by the trend of using earth-based materials, which demand precise technical specifications. However, these specifications are often overlooked in conventional contract clauses, leading to technical disputes later (Nwaki & Eze, 2022).

The issue of claims becomes more intricate when faced with the regulatory gap between national contract standards applicable within State-Owned Enterprises (SOEs), such as PT PLN (Persero), and established international standards, such as the FIDIC Conditions of Contract. National contract standards often do not rigidly regulate the notice-of-claim mechanism and time bars. Conversely, some contracts apply rules that are too rigid without considering the principle of reasonableness (*asas kepatutan*). Meanwhile, the FIDIC Silver Book has established an early warning system mechanism that requires notification within a certain timeframe as a formal requirement for claim validity (Ilma et al., 2021; Cho et al., 2025). The lack of harmonization between these two contract regimes creates legal uncertainty. On the one hand, foreign contractors demand standard rights protection equivalent to that under FIDIC. On the other hand, Employers are bound by domestic regulations that are not yet fully adaptive.

Furthermore, construction disputes are often exacerbated by differing interpretations of field facts and technical data. In the era of construction digitalization, reliance on manual documentation and subjective interpretation should be abandoned. Current research indicates that integrating technologies such as Building Information Modeling (BIM) and Blockchain can provide indisputable legal evidence in claim management (Kalogeraki & Antoniou, 2024). However, the contract law framework in Indonesia has not fully accommodated the validity of this digital data as a golden record. In fact, using this technology can bridge the perception gap between parties regarding the project's factual conditions. Consequently, potential disputes arising from information distortion can be minimized.

In addition to document and technology aspects, the currently available dispute-resolution mechanisms are considered ineffective at preventing conflict escalation. Conventional mechanisms such as arbitration or litigation are often adversarial. These mechanisms are pursued only after the dispute has intensified, ultimately damaging long-term business relationships. On the other hand, international best practices have introduced Standing Dispute Boards (SDBs) as a real-time dispute prevention mechanism that operates from the start of the project. A case study of the Asahan 3 Hydroelectric Power Plant (HEPP) project demonstrated that SDB effectively resolved dozens of contractor claims without resorting to arbitration. This mechanism proved to maintain cash flow and project physical progress (Wisatrioda et al., 2025). This

success provides a strong signal for the need to institutionalize similar mechanisms in national construction contract standards.

Based on the problems outlined above, this research has juridical urgency to fill the legal gap in the regulation of comprehensive claim prevention mechanisms. Previous research tends to be partial. The majority discuss only the technical aspects of claims or downstream dispute resolution, without addressing the root problems upstream (pre-construction) and contract system integration. Therefore, this research formulates three specific research objectives. *First*, to analyze the juridical implications of incomplete pre-construction documents on the parties' equality of understanding and claim validity. *Second*, to evaluate the regulatory gap in notification mechanisms, variations of work, and documentation between national contract standards and the FIDIC Silver Book. *Third*, to construct a harmonization model of claim prevention clauses that integrates digital documentation systems and SDB to ensure legal certainty.

The benefits of this research are expected to provide a dual contribution. Theoretically, this research enriches the body of Construction Law in Indonesia. Specifically, it contributes to the application of the principles of balance and reasonableness in construction service contracts. Practically, the results of this research are expected to serve as a reference for policymakers within Electricity SOEs in revising EPC contract standards. The goal is to create a contract ecosystem that is fairer, more transparent, and more efficient at preventing state losses from unnecessary construction disputes.

METHOD

This research constitutes normative legal research (doctrinal research) that is prescriptive and applied. The research focuses on analyzing the harmonization of legal norms in electricity construction contracts. The selection of this research type is based on the urgency to go beyond merely describing the dispute phenomenon. Furthermore, this research aims to evaluate the coherence between Indonesian positive legal norms and international contract standards, and to formulate a new concept of claim prevention. The research focuses on the inventory of positive law, the identification of legal principles, and the alignment of vertical and horizontal legal rules governing the contractual relationship between the Employer (Electricity SOE) and the Contractor.

To address the complexity of issues involving domestic regulations and global standards, this research applies three approaches simultaneously: the statute approach, the comparative approach, and the case approach (Qamar & Rezah, 2020). The statute approach is used to examine the consistency of Law Number 2 of 2017[1]

[1]Law Number 2 of 2017, as amended by Article 52 of Government Regulation in Lieu of Law Number 2 of 2022.

and Law Number 30 of 2009[2], along with their implementing regulations, with respect to the principle of freedom of contract. The comparative approach is conducted on an equivalent basis (*apple-to-apple*) to evaluate the gap in claim mechanism regulations between the National Standard Bidding Documents and the FIDIC Silver Book. Subsequently, the case approach is used to examine real disputes in the Asahan 3 HEPP Project and test the effectiveness of the SDB mechanism compared to the Ad-hoc mechanism.

The legal materials used in this research consist of primary and secondary legal materials (Sampara & Husen, 2016). Primary legal materials include legislation related to construction services and electricity, the Civil Code as the basis for the principle of *pacta sunt servanda*, and specific contract documents for electricity infrastructure projects. Secondary legal materials include literature, accredited legal journals, and relevant prior research, including studies on construction dispute causal mapping and work variation analysis. The collection of legal materials is conducted through library research, reinforced by the tracing of internal project documents (documentary study). This step is taken to obtain authentic and precise contract clause data.

The legal material analysis technique is performed qualitatively using the deductive syllogism method (Irwansyah, 2020). The analysis begins with classifying crucial clauses that cause disputes. In analyzing claim validity and party entitlement, this research adopts the knowledge-driven checklist instrument developed by Cho et al. (2025). This instrument is used to map notice procedure compliance and detailed proof in national contracts, which are then juxtaposed with strict FIDIC standards. This analysis aims to identify legal loopholes in pre-construction documents that have been the root cause of disputes.

Furthermore, a comparative analysis is conducted by interpreting clauses on time bars and work variation procedures. The methods used are systematic and teleological interpretation. This interpretation aims to discover the legal meaning behind the contract text. Additionally, this interpretation tests whether the application of strict FIDIC-style time-bar clauses violates the principles of good faith and reasonableness under Indonesian law. The interpretation results are then examined in light of the doctrine of changed circumstances (*rebus sic stantibus*) to assess the long-term flexibility of contracts in the face of economic and technical fluctuations.

In the final stage, this research employs the legal construction method to formulate a harmonization model for claim prevention clauses. This construction is achieved by synthesizing the empirical success of SDB implementation in the Asahan 3 project with the potential use of BIM technology as valid digital evidence. This analysis refers to the research trend by Kalogeraki and Antoniou (2024), which positions technology as an instrument for mitigating interpretation disputes. Through this

[2]Law Number 30 of 2009, as amended by Article 42 of Government Regulation in Lieu of Law Number 2 of 2022.

systematic series of methods, the research is expected to produce a legal prescription that is not only logically academic but also practically applicable (workable). This prescription can later be applied in refining contract standards within the Electricity SOE environment.

RESULTS AND DISCUSSION

A. The Urgency of Legal Certainty in Pre-Construction Documents: Implications for Equality and Claim Validity

Fundamental problems in the construction industry, particularly in strategic projects such as power plants, often stem from the phase preceding the groundbreaking. Disputes that arise downstream (the construction execution phase) are residues of obscurity that occurred upstream (the design and pre-contract phase). Causality analysis shows that construction disputes do not occur in a vacuum. Disputes are the result of a series of interrelated factors. Conceptual errors and unclear scope definitions have been identified as root causes of later disputes (Tanriverdi et al., 2021). In the context of EPC projects, where design and execution responsibilities lie with the Contractor, the quality of the Employer's Requirements, which serves as the initial reference, becomes crucial. When this document is ambiguous or incomplete, it leads to differing interpretations between the Employer and the Contractor. In turn, this leads to claims for extension of time and additional costs. Therefore, claim prevention efforts must begin by ensuring the integrity and clarity of pre-construction documents as the foundation of the engagement.

In practice, within the national Electricity SOE environment, pre-construction documents are often prepared under less-than-ideal conditions. This preparation is frequently driven by strict operational targets. This results in tender documents, specifically the Employer's Requirements, being overly general (open-ended) or even technically immature at the time the contract is signed. Nugroho and Hardjomuljadi (2022) highlighted that during the COVID-19 pandemic, inefficiency and disruption in national power plant projects further exacerbated the potential for claims. However, the root of the problem remains traceable to the unreadiness of the initial documents to anticipate risks. This incompleteness creates information asymmetry that is disadvantageous to the Contractor's bargaining position. Contractors are forced to calculate risks that are not clearly defined in their bid prices. This condition substantially contradicts the principles of transparency and efficiency in the procurement of goods and services. Additionally, this condition can incur high economic costs due to prolonged disputes.

Juridically, the unreadiness of pre-construction documents has serious implications for the principle of good faith in the pre-contractual phase. Article

1338 section (3) of the Civil Code affirms that agreements must be performed in good faith. Wiraantaka et al. (2025) emphasized that balance and equality are derivations of good faith that must be reflected in the contract substance. When the Employer presents incomplete documents but demands perfect results at a fixed price (lump sum), a violation of the principle of balance has occurred. Construction contracts should be instruments for fairly distributing risks. Contracts are not a means to shift the entire risk of uncertainty solely to one party. In this perspective, the clarity of pre-construction documents is not merely a technical necessity but a legal obligation to ensure the validity of the agreement.

The validity of claims submitted by the Contractor due to document obscurity often becomes the main point of dispute. Qadri et al. (2025), in their study on overhead cost claims, asserted that claims must be based on valid legal conditions. These conditions include default, force majeure, or variation orders, and must meet causality proof requirements. If the initial documents are defective, any additional instructions or clarifications provided by the Employer during project execution may be treated as variation orders. This bears consequences for price and time adjustments. However, without clear regulation mechanisms in national contracts regarding the limits of Employer's Requirements, these claims are frequently rejected. Rejection is often based on the rationale that it constitutes the Contractor's risk under a lump-sum contract. This creates legal uncertainty, hindering project completion and harming both parties.

Furthermore, the absence of precise documents in the pre-construction phase impacts the non-achievement of a true "consensus" in the legal sense. Consensus requires an equal understanding between the parties regarding the object of the agreement. If one party (the Contractor) lacks a complete picture of the scope of work due to hidden or unavailable information, the agreement element becomes defective. Tanriverdi et al. (2021) used causal mapping to show that "lack of communication" and "unrealistic expectations" from the project owner are the primary drivers of disputes. Apart from the technical substance, the risk of contract language readability is also a crucial factor. Koc and Gurgun (2022) found that grammatical complexity and the use of ambiguous terms in contract clauses directly correlate with dispute frequency. Therefore, strengthening pre-construction documents must be viewed as a holistic effort to align the frequency of understanding. This effort encompasses both technical and language aspects between the Employer and the Contractor, thereby minimizing the room for uncontrolled interpretations that become the seeds of disputes.

In the context of claim prevention, harmonizing technical requirements with legal compliance is essential. Pre-construction documents must not be viewed merely as technical documents, but as legal documents defining the limits of contractual obligations. Any ambiguity in technical specifications or initial

design drawings must be resolved before contract signing. At the very least, a fair resolution mechanism must be set out in the contract clauses. This aligns with the findings of Abdelalim et al. (2024), who identified that variations due to design or specification changes are the most dominant cause of claims in the Middle East and North Africa (MENA) region. This region possesses construction market characteristics similar to those of Indonesia, which is currently intensively building infrastructure. Thus, legal certainty in pre-construction documents is an absolute prerequisite (*conditio sine qua non*) for creating a healthy and dispute-free construction climate.

Finally, the analysis of the urgency of legal certainty in pre-construction documents affirms that reform in national construction contract governance must start from upstream. It is insufficient to merely improve dispute resolution mechanisms downstream if the source of the problem, namely the quality of initial documents, is not addressed. Comprehensive standardization of the Employer's Requirements adopting international best practices is required. This allows parties to conduct accurate risk assessment from the outset. Only in this way can the principles of balance and fairness in construction contracts be realized. Simultaneously, this guarantees the validity of claims that may arise later as a logical consequence of project dynamics, not as a result of negligence in planning.

B. Evaluation of Claim Mechanism Regulation Gap: A Comparative Study of National Contracts vs. FIDIC Silver Book

Evaluating the effectiveness of dispute-prevention mechanisms requires a thorough comparative analysis. This analysis compares the national construction contract regime with the tested international standard, the FIDIC Conditions of Contract. The fundamental difference between these two regimes lies in their philosophies of formation. National contracts within the SOE environment are often constructed with a rigid administrative approach to secure state finances. Conversely, FIDIC is built upon the principle of balanced risk allocation. Ilma et al. (2021), in their comparative study, found that national contract standards (based on Presidential Regulations and the Regulations of the Minister of Public Works and Public Housing) have significant gaps compared to FIDIC. These gaps encompass the regulation of the parties' rights and obligations, particularly regarding payment mechanisms and dispute resolution. This philosophical gap manifests as desynchronization in field operational procedures. Foreign contractors accustomed to the flexibility and procedural certainty of FIDIC frequently clash with the layered bureaucracy of national contracts. Consequently, claims that should be technically resolvable at the field level often escalate into legal disputes due to the absence of an effective intermediary mechanism.

The administrative rigidity inherent in national contracts is inseparable from the interaction between the sectoral legal regime and the public law

governing it. In the context of electricity projects, Law Number 2 of 2017 has laid a progressive foundation for equal contractual relationships (Article 47) and efficient dispute resolution (Article 88). However, at the implementation level in SOEs, the spirit of equality enshrined in Law Number 2 of 2017 is often distorted by rigid interpretations of Law Number 30 of 2009 and regulations on state finances. Law Number 30 of 2009 establishes electricity availability as a public interest that must be safeguarded in accordance with strict efficiency principles. This principle is often translated by state auditors as a prohibition against cost flexibility (fixed price). Wiraantaka et al. (2025) found that this normative disharmony creates "administrative fear" among officials responsible for approving claims, leading them to avoid approving valid claims, fearing they will be deemed to have caused state loss. Consequently, claim mechanisms in national contracts become more bureaucratic and defensive than the pragmatic, solution-oriented FIDIC mechanisms. This undermines the principle of legal certainty, which is an absolute prerequisite for a healthy investment climate.

One of the most crucial gaps lies in the regulation of the notice-of-claim mechanism. Sub-Clause 20.1 of the FIDIC Silver Book imposes a very strict 28-day time bar on the contractor to submit a notification after becoming aware of the event underlying the claim. If this time limit is exceeded, the contractor's right to claim is considered forfeited by law. Winata and Hardjomuljadi (2021) highlighted that this time-bar clause functions as an early warning system. This clause requires parties to resolve issues while they are still fresh, preventing claims at the end of the project. Conversely, in many national contract standards, provisions regarding notification time limits are often not strictly regulated, or the sanctions are not fatal to rights. This lack of firmness is frequently exploited by contractors to delay claim submission until the end of the project (ambush claim). This practice ultimately surprises the Employer with inflated cost bills that are difficult to verify for accuracy.

However, the application of strict FIDIC-style time-bar clauses within the Indonesian legal system also leaves its own juridical debate. Although Sub-Clause 20.1 of the FIDIC Silver Book aims for legal certainty, its absolute application may conflict with the principles of good faith and reasonableness under Article 1338 section (3) of the Civil Code. This is especially true if notification delays are caused by matters beyond the contractor's control, or if the Employer was actually aware of the event but hid behind administrative formalities. Wiraantaka et al. (2025) warned that in Indonesian civil law, substantial justice must not be overridden by mere procedural formalities. Therefore, harmonizing notification regulations in national contracts cannot simply copy FIDIC provisions. Instead, there must be a modification with a measurable "waiver" mechanism. A waiver may be granted if the contractor can prove that the Employer suffered no actual prejudice due to the notification delay.

In addition to notification, the variation order procedure is another area fraught with regulatory gaps and potential disputes. Abdelalim et al. (2024) identified that variations of work are a primary cause of claims in many international projects. In the FIDIC regime, the Engineer or Employer's Representative is granted sufficiently broad authority to issue variation instructions and immediately determine their impact on cost and time. This allows the project to remain dynamic without being hindered by administrative processes. This differs from practices in national contracts within the SOE environment. Variation approvals often have to go through multiple bureaucratic levels, including internal audits and the board of directors' approval, which can take months. This procedural sluggishness frequently forces contractors to perform additional work without a clear legal basis (only oral instructions), which later becomes a time bomb for payment disputes.

Regarding claim substantiation, documentation standards are also a weak point in national contracts. The FIDIC Silver Book requires contemporary records as indisputable primary evidence. Cho et al. (2025) developed a knowledge-driven checklist detailing the requirements for Detailed Proof that the contractor must meet. These requirements include proof of causality, quantum calculation, and schedule impact. In national contracts, these documentation requirements are often general and non-standard. This opens a wide range of interpretation for both auditors and arbitrators. Consequently, many technically valid claims are rejected due to insufficient administrative evidence. Conversely, baseless claims can slip through due to weak verification. Therefore, adopting strict documentation checklist standards, as suggested by Cho et al. (2025), becomes imperative to ensure claim accountability.

Amidst contract procedural rigidity, the doctrine of *rebus sic stantibus* becomes relevant to discuss as a safety valve. Yanuar et al. (2025) found that, in long-term infrastructure projects vulnerable to macroeconomic fluctuations and regulatory changes, the principle of *pacta sunt servanda* (agreements must be kept) must be balanced with *rebus sic stantibus*. This is to prevent extreme injustice for one party. FIDIC addresses this through the Price Adjustment and Change in Law clauses. However, in national contracts, especially lump-sum contracts, the application of price adjustments is often strictly limited or even eliminated under the pretext of budget efficiency. This rigid stance is actually counter-productive as it forces contractors to undertake efficiencies that sacrifice quality or trigger disputes to survive. This evaluation affirms the need to include more flexible, fair adjustment clauses in national contracts, based on objective, measurable parameters.

Overall, this comparative evaluation shows that the gap between national contracts and FIDIC is not merely a redactorial issue. It is a paradigmatic problem

in how we view risk and fairness. Harmonization cannot be partial; it must comprehensively address the substance of the claim mechanism regulation. Reformulation of national contract clauses adopting FIDIC procedural discipline is needed to guarantee certainty. Such discipline includes notification timeliness and documentation standards. However, the reformulation must maintain flexibility consistent with national legal corridors, such as accommodation for *rebus sic stantibus* and the principle of reasonableness. Only with this balance can construction contracts transform from mere administrative documents into effective project management instruments for preventing disputes.

C. Construction of Claim Prevention Harmonization Model: Integration of SDB and Digital Technology

The problematic issues of construction disputes rooted in pre-construction document uncertainty and contract regulation gaps cannot be resolved solely through a normative approach. A breakthrough model is required to bridge the administrative rigidity of national contracts with the risk management flexibility of international standards. This harmonization model must move beyond the reactive "dispute resolution" paradigm toward a proactive "dispute avoidance" paradigm. The construction of this model is based on two mutually reinforcing pillars. The first pillar is the institutionalization of the SDB mechanism as a permanent organ for dispute prevention. The second pillar is the integration of digital technology (BIM and Blockchain) as an indisputable legal-evidence instrument (a single source of truth).

The need to implement SDB in strategic national construction contracts, particularly in electricity projects, has received strong empirical support. A case study on the Asahan 3 HEPP Project convincingly proved the effectiveness of this mechanism. Wisatrioda et al. (2025) revealed that, prior to the contract amendment that activated the SDB, the project experienced a deadlock due to 25 contractor claims that remained unresolved through the Engineer's Determination mechanism. The failure of this Engineer mechanism was caused by perceptions of non-neutrality and limited authority in deciding disputes with financial impact. However, after the SDB was activated under Contract Amendment No. 1, the five formal opinions issued by the SDB successfully resolved those 25 claims, with none proceeding to arbitration. This success affirms that the presence of an independent, competent third party involved from the outset (standing) can create an objective technical dialogue space. This dialogue space is often absent in the hierarchical contractual relationship between the SOE and the Contractor.

In the framework of harmonization, the proposed SDB model must not blindly adopt FIDIC provisions. This model must be aligned with the national legal framework. SDBs in national contracts must be positioned as an extension of the supervision function, with legal legitimacy equivalent to that of an adjudication

decision. This aligns with the mandate of Law Number 2 of 2017, which encourages out-of-court dispute resolution. However, the greatest challenge is providing "administrative immunity" for Commitment-Making Officers (CMOs) within the PT PLN/SOE environment, so they can execute SDB recommendations without fear of criminalization for causing state loss. Therefore, this model proposes that binding SDB decisions be explicitly recognized in internal SOE regulations as a valid and auditable basis for payment. This will provide legal certainty for decision-makers.

The second pillar of the harmonization model is the utilization of technology as an evidentiary database. One of the main weaknesses in conventional claim management is the poor accuracy of supporting documents. These data are often still paper-based, fragmented, and prone to manipulation. Kalogeraki and Antoniou (2024) highlighted a global trend in which BIM and Blockchain technologies are increasingly used as primary tools in claim management. In the proposed model, BIM use is not limited to design and visualization functions. Its function is elevated to BIM-based Contract Administration. With this system, every design change or site instruction is automatically recorded in an encrypted digital model (via Blockchain), complete with time and cost metadata. This digital data is then agreed upon in the contract as the gold standard or the primary valid evidence in verifying variation claims.

The integration of SDB with digital technology will create a robust ecosystem for claim prevention. The SDB, tasked with periodically monitoring project progress, can use real-time data from the BIM system to detect potential disputes early. For instance, if a physical progress delay is detected in the 4D BIM model (schedule), the SDB can immediately summon the parties to seek mitigation solutions before the delay accumulates into massive Liquidated Damages claims. This data-driven "Early Warning" mechanism is far more objective compared to manual progress reports, which are often subjective. Thus, SDB decisions are no longer based solely on assumptions or verbal arguments, but are supported by precise digital forensic data. This will enhance the acceptability of the decision in the eyes of both parties.

This harmonization concept also offers a hybrid path between FIDIC-style procedural certainty and substantial justice typical of national law. Regarding the claim notification mechanism, this model maintains time discipline (time-bar) as a disciplinary tool. However, the model complements it with an automated, system-based notification system. If the Contractor experiences an event that may lead to a claim (e.g., restricted land access), the digital project management system will automatically send an initial notification to the Employer and the SDB. Consequently, the risk of "forfeiture of rights" due to manual administrative negligence can be minimized. This technological approach elegantly resolves the

classic debate over waiving or forgiving time-barred sanctions, ensuring real-time transparency and upholding the principle of good faith in contracting.

Furthermore, this harmonization model addresses the challenge posed by the *rebus sic stantibus* doctrine in the face of extreme material price fluctuations. By using Smart Contracts linked to trusted market price indices, price adjustments can be automatically applied according to agreed formulas. This process does not require protracted renegotiation. Yanuar et al. (2025) emphasized the importance of price flexibility to maintain project continuity. In this model, Smart Contract technology functions as the automatic executor of price adjustment clauses. This technology guarantees that the Contractor receives their rights on time and in the correct amount, in line with actual market conditions, while the Employer is protected from unreasonable price mark-ups.

Implementing this integrative model certainly requires adequate legal and technical infrastructure readiness. On the legal side, adjustments to PT PLN's Standard Bidding Documents (SBD) are needed to accommodate "digital" clauses recognizing the legal validity of BIM data and Smart Contracts. From a technical perspective, both PT PLN and the Contractor require human resource capacity building to operate digital contract management systems. However, this initial investment is commensurate with the long-term benefits, namely the drastic reduction in dispute costs and the certainty of on-time project completion. As demonstrated by Cho et al. (2025), knowledge-driven, structured claim governance is key to minimizing risks in global construction projects.

Finally, the construction of this harmonization model affirms that the future of construction law in Indonesia can no longer be separated from technological advancement. The transformation from manual, bureaucratic processes to digital, transparent processes is inevitable. The model integrating institutional wisdom (SDB) with technological intelligence (BIM/Blockchain) is expected to become a new best practice in the national construction industry. With this model, the construction contract is no longer a "dead document" opened only when disputes arise. Instead, the contract becomes a "living instrument" that actively manages risks, maintains the balance of rights, and guarantees the success of electricity infrastructure projects for the nation's interest.

CONCLUSIONS AND SUGGESTIONS

Based on a comprehensive legal analysis of harmonizing claim prevention mechanisms in electricity construction contracts, this research concludes that three interrelated fundamental points emerge. *First*, claim validity and contractual relationship equality are heavily determined by legal certainty in the pre-construction phase. Causality analysis proves that disputes arising in the execution phase (downstream) are logical consequences of incomplete Employer's Requirements

documents and errors in concept design in the planning phase (upstream). This document's unreadiness creates an information asymmetry that violates the principles of good faith and balance in contracting. Consequently, the consensus formed becomes substantially defective.

Second, there is a significant regulatory gap between national contract standards within the SOE environment and the international FIDIC Silver Book standard. This gap is particularly evident regarding the notice of claim mechanism, variation procedure, and documentation requirements. Administrative rigidity in national contracts stems from the disharmony between Law Number 2 of 2017, which is pro-equality, and Law Number 30 of 2009, which is pro-efficiency. This condition frequently hinders rapid claim resolution. Conversely, the disciplined FIDIC time-bar mechanism, while effective as an early warning system, requires adjustment (waiver) to align with the principle of reasonableness in national law. This lack of harmonization creates legal uncertainty that is detrimental to both parties.

Third, the ideal harmonization model for preventing future claims is an integrative one that combines institutional and technological mechanisms. The implementation of SDB has been empirically proven effective in resolving disputes in real-time and maintaining project smoothness, as demonstrated in the Asahan 3 HEPP case. The effectiveness of this SDB will be further optimized by integrating digital technologies such as BIM and Blockchain. These technologies function as indisputable primary evidence (golden record). The synergy between the "wisdom" of SDB and the "intelligence" of digital data can transform the construction contract paradigm. This transformation changes the contract from a merely reactive administrative instrument into a proactive, equitable risk-management instrument.

As a practical implication and follow-up to the conclusions above, this research recommends strategic steps for stakeholders. To PT PLN and other Electricity SOEs, it is advised to immediately revise the Standard Bidding Documents (SBD) for EPC projects by adopting the SBD clause as a mandatory mechanism for large-scale strategic projects. Furthermore, it is recommended to adopt the BIM-based Contract Administration protocol as the standard for claim substantiation. This revision must be accompanied by internal regulations that provide administrative protection for commitment-making officials when executing SDB decisions. This is crucial to overcome psychological barriers resulting from the fear of audits.

For the Government as the regulator, it is advised to issue technical guidelines harmonizing the implementation of Law Number 2 of 2017 and Law Number 30 of 2009. These guidelines are particularly necessary regarding the flexibility of price adjustment in the event of changed circumstances (*rebus sic stantibus*). These guidelines are important to provide legal certainty that budget efficiency must not be achieved at the expense of contractual justice. Finally, for academics and legal

researchers, it is advised to conduct further studies regarding the evidentiary validity of blockchain data in construction disputes within Indonesian courts. This study is needed to strengthen the legal foundation for the application of technology in future national contract law.

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