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Legal Design of Next-Generation Petroleum Contracts: Developing a Smart Contractual Framework for Integrating Sustainable Development, Risk Governance, and Value Creation in Upstream Oil and Gas Agreements

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1. Round 1

1.1. Reviewer 1

Reviewer:

In the paragraph stating that "The social and developmental dimensions of petroleum contracting are equally important," the manuscript introduces corporate social responsibility and community engagement. However, the discussion requires greater attention to the legal enforceability of social obligations. The authors should explain how community-development commitments can be incorporated into petroleum agreements without creating uncertainty regarding governmental responsibilities. The revised version should clarify the difference between contractual obligations imposed on investors and broader public-policy obligations belonging to the state.

In the paragraph beginning with "Technology transfer constitutes a second major component of value creation," the manuscript correctly identifies technology transfer as a central objective of host states. However, the discussion remains general and should provide a more detailed contractual architecture. The authors should specify what elements a technology-transfer clause should contain, including knowledge categories, training obligations, intellectual-property arrangements, implementation timelines, and compliance verification mechanisms. This would significantly strengthen the practical contribution of the proposed framework.

In the paragraph beginning with "The contract should connect these forms of value to measurable indicators," the manuscript proposes performance indicators for value creation. However, the authors should provide a more detailed methodology for selecting and evaluating such indicators. The revision should explain who determines performance metrics, how disagreements are resolved, how indicators are updated over time, and whether these indicators create legal obligations or merely management tools.

In the paragraph discussing "The proposed smart framework combines substantive clauses, institutional mechanisms, and digital infrastructure," the article presents an integrated model but does not sufficiently explain the hierarchy among its components. The authors should clarify whether commercial obligations, sustainability obligations, digital mechanisms, and governance procedures have equal legal status or whether some elements operate as interpretative principles while others create enforceable duties.

In the paragraph beginning with "Cybersecurity is another essential element," the manuscript appropriately identifies cyber risks in digital petroleum governance. However, the discussion should be expanded by examining contractual allocation of cybersecurity responsibilities. The authors should clarify whether cybersecurity obligations should be treated as operational obligations, force majeure issues, confidentiality duties, or independent compliance requirements. This distinction has significant implications for liability and remedies.

Authors revised the manuscript and uploaded the document.

1.2. Reviewer 2

Reviewer:

In the paragraph stating that "Local-content obligations operate alongside technology transfer but pursue a wider economic objective," the article provides an important observation regarding domestic development. However, the authors should further analyze the potential conflict between local-content requirements and investment efficiency. The revision should address how contracts can promote domestic participation while avoiding excessive costs, reduced competitiveness, or discriminatory procurement practices. A discussion of proportionality and gradual implementation would improve the argument.

In the paragraph beginning with "Risk governance constitutes another major dimension of the proposed contractual model," the manuscript makes an important conceptual contribution by distinguishing risk governance from traditional risk allocation. However, the authors should develop a clearer taxonomy of petroleum-project risks. The revised article should categorize risks into geological, operational, political, regulatory, environmental, financial, technological, and cybersecurity risks and explain which contractual mechanism is most appropriate for each category.

In the paragraph discussing stabilization clauses, the manuscript argues that "The solution is not necessarily to eliminate stabilization, but to redesign it." This is a significant argument, but it requires deeper legal analysis. The authors should provide a more detailed explanation of how modern stabilization clauses can preserve investor confidence while allowing legitimate environmental and social regulation. The discussion should distinguish between freezing clauses, economic-equilibrium clauses, and hybrid stabilization mechanisms.

In the paragraph beginning with "Digital transformation further expands the possibilities of contractual design," the article introduces artificial intelligence, blockchain, and smart contracts. However, the current discussion risks presenting these technologies as universally beneficial. The authors should include a more critical assessment of technological limitations, including data reliability, cybersecurity risks, algorithmic bias, legal enforceability, and institutional readiness. A balanced analysis would increase the academic credibility of this section.

In the paragraph stating that "Smart contracts remain subject to fundamental legal questions concerning interpretation, mistake, modification, jurisdiction, and the relationship between automated execution and traditional legal rules," the authors identify important issues but do not fully explore their consequences. The revision should explain how conventional contract doctrines such as good faith, force majeure, impossibility, and contractual interpretation interact with automated contractual processes. This is particularly important because petroleum agreements involve complex discretionary judgments that cannot always be reduced to automated execution.

In the paragraph addressing "The Iranian context," the manuscript discusses the Iran Petroleum Contract (IPC) as an example of contractual reform. However, the analysis would benefit from a more systematic comparison between IPC and the proposed next-generation framework. The authors should identify precisely which IPC features represent progress and which limitations require reform. A comparative table or analytical framework would significantly improve the clarity of this section.

In the paragraph beginning with “The evolution from concessions to hybrid and governance-oriented models reveals that a petroleum contract is not simply a transaction,” the manuscript advances the argument that petroleum agreements create institutional relationships. This is a central theoretical contribution and should be expanded. The authors should explain how this relational dimension affects contract duration, renegotiation mechanisms, cooperation duties, information sharing, and dispute prevention.

In the paragraph discussing “General principles of contract law remain essential within this governance structure,” the manuscript refers to general contractual principles but does not sufficiently connect them to petroleum-specific challenges. The authors should elaborate on how principles such as good faith, contractual certainty, binding force, and changed circumstances operate differently in long-term energy projects compared with ordinary commercial contracts.

Authors revised the manuscript and uploaded the document.

2. Revised

Editor’s decision: Accepted.
Editor in Chief’s decision: Accepted.