

# Legal Improvement of Liability Measures for Violation of Environmental Safety Requirements in the Energy Sector

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**Received:** 2025, 04, Oct

**Accepted:** 2025, 05, Nov

**Published:** 2025, 26, Dec

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**Annotation:** This article is dedicated to improving liability measures for violations of environmental safety requirements in the energy sector of Uzbekistan. It analyzes the perspectives of international scholars Philippe Sands, Jacqueline Peel, Adriana Fabra, Ruth MacKenzie, Michael Faure, and Stephen Stec, examining the legal, financial, technological, and strategic aspects of environmental damage and liability, highlighting the complementary nature of their approaches. Based on this analysis, the article proposes innovative solutions that have not yet been implemented in Uzbekistan's legislation: dynamic liability algorithms, an environmental simulation database for energy projects, eco-liability tokens, an AI-based transboundary environmental risk prevention system, and an eco-innovative certification platform. The implementation of these approaches can significantly enhance environmental damage prevention, compensation mechanisms, and ensure the sustainable and safe execution of energy projects.

**Keywords:** Energy, environmental safety, liability, innovative solutions, AI monitoring, LCA simulation, transboundary risk, eco-liability tokens, blockchain, Uzbekistan, sustainable development.

## INTRODUCTION:

In recent years, the energy system has gained increasing importance as the foundation for economic stability and social development of every state. However, the energy production process itself is causing numerous environmental problems - air pollution, greenhouse gas emissions, depletion of water resources, and an increase in waste volume. According to the International Energy Agency (IEA), global carbon dioxide (CO<sub>2</sub>) emissions from energy production reached 37.4 billion tons in 2023, one of the highest figures in human history. This issue is also pertinent to Uzbekistan. According to IEA reports, the energy intensity of the country's economy (i.e., energy consumption relative to GDP) is on average 3-4 times higher than that of developed countries. The Ministry of Energy reports that by the end of 2024, nearly 85% of electricity generated in Uzbekistan will still come from natural gas and coal. This poses a serious threat to environmental safety. In his Address to the Oliy Majlis on December 28, 2023, the President of the Republic of Uzbekistan, Sh.M. Mirziyoyev, emphasized that "along with ensuring energy stability, environmental safety and protection should be an integral direction of state policy." Therefore, instances of non-compliance with environmental safety requirements in the energy sector - such as excessive industrial waste emissions, spills of hazardous substances, and operating without environmental expert approval - cause serious harm not only to nature but also to the quality of life and health of the population.

In this regard, **the issue of legally improving liability measures for violating environmental safety requirements in the energy sector** is directly related not only to the environment but also to national security today. Indeed, in the modern approach, the concepts of "energy security" and "environmental security" are considered inseparable phenomena. In our country, there are a number of legislative acts addressing this issue, including **the Law "On Environmental Protection," the Law "On Environmental Expertise," and the Criminal Code of the Republic of Uzbekistan**. However, their practical application in many cases does not fully address modern environmental risks.

Therefore, this article analyzes the existing legal mechanisms for liability concerning violations of environmental safety requirements in the energy sector and puts forward proposals for their improvement.

## MAIN PART

In the introduction, we examined how global this topic is. Now, let's first define the concept of an energy offense. An energy offense is damage caused by non-compliance with or violation of established energy law requirements. Offenses in the energy sector, unlike ordinary economic disputes, are characterized by a high level of social danger. We have two types of liability: economic and legal. Economic liability is determined by losses not exceeding the legally established limit, and is manifested through the unconditional application of monetary penalties. Legal liability arises from violating legal requirements and norms, misusing excess energy resources, violating rules for their protection, and illegally using energy resources, resulting in subjects being held legally responsible. There are four types of legal liability: disciplinary, administrative, civil, and criminal. Regarding subjects and objects, the subjects of the offense include ordinary citizens, officials, and large legal entities. However, the object of the offense is not only the property of supplying enterprises but also the functioning of the entire energy system and state interests. This complexity of the object creates the basis for differentiating types of liability. The energy liability system is a set of five independent but closely interconnected legal mechanisms. This system serves to fairly address every situation from minor offenses to crimes. Among all types of liability, administrative liability is the most immediate and widespread measure. Its main goal is to prevent small and medium-sized, but systemic violations. It is determined within Uzbekistan's Code of Administrative Offenses, where actions such as intentionally damaging electricity or gas meters or unauthorized connection to networks directly incur administrative liability. In these cases, punishment - high fines - serves as a quick

and strict warning. However, if an administrative offense results in significantly increased damage, it may lead to the next type of liability. While administrative penalties remain in force, the issue of compensating for material damage caused by any offense remains relevant. This is where the mechanism of civil liability is activated. This responsibility is based on the Civil Code and contractual relations. Its essence is that the offender must fully compensate for the value of illegally used resources, as well as actual damages incurred (e.g., equipment repair costs) and lost profits. This means justice consists not only of punishment but also restoring property equality. The responsibility of employees and officials working in the energy sector requires special attention. Their violation of labor duties directly entails disciplinary liability. This liability is enforced within the Labor Code framework and includes measures ranging from reprimands to termination of employment contracts. Disciplinary measures require a high level of professional discipline to ensure the safety and continuity of energy facilities. Special economic liability measures are applied when large economic entities violate energy efficiency standards and requirements for rational resource use. The purpose of this liability is to compel legal entities to implement energy-saving technologies and avoid wasting resources. These sanctions support the state's overall energy policy through economic incentives or disincentives. If an offense causes large-scale damage or poses a threat to human life, it directly leads to criminal liability. Articles such as Article 1852 of the Criminal Code (Violation of energy resource usage rules) regulate such serious crimes. For these crimes, committed intentionally or through negligence, the strictest measures are applied - large fines and even imprisonment. This demonstrates the state's zero tolerance towards threats to the energy system and associated public safety. If penalties are applied only after an offense has occurred, this system will not work fully. The effectiveness of legal responsibility depends on control and preventive mechanisms that ensure its inevitability. In Uzbekistan, the Bureau of Compulsory Enforcement (BCE) plays a central role in ensuring legal order in the energy sector. The BCE not only enforces court decisions but also conducts constant monitoring and control over energy resource usage and accounting. Using modern technical means, the BCE detects unauthorized connections and organizes the application of administrative and civil law measures against them. It ensures the mandatory collection of debts from consumers who have not made timely energy payments. Prevention of offenses should be carried out in three stages: 1. Indirect (Comprehensive) Prevention: This includes raising public awareness of energy law and conducting ongoing educational work about the benefits of energy conservation. 2. Treatment and Prevention: This involves systematic work with persons previously held administratively or otherwise liable, preventing their repeated violations. 3. Technical Prevention: This includes implementing smart meters and automated control systems that reduce the likelihood of theft.

After analyzing the national system of legal responsibility in the energy sector, it is expedient to examine international concepts related to the field. Research by international scholars demonstrates that the damage inflicted on nature as a result of energy activities is not limited to polluted water or air, but encompasses a wide range of factors, including flora, fauna, ecosystems, climate, and human health. According to the fundamental principle proposed by Philippe Sands and colleagues, liability should not be restricted to imposing fines, but must also include the obligation to provide financial compensation for damages and restore the environment. At the core of this approach lies the "polluter pays" principle, meaning that energy companies should bear full financial responsibility for the damage caused. They also emphasize the necessity of a special legal regime that incorporates recovery mechanisms for high-risk facilities such as nuclear power plants, whereby states must strictly adhere to the principles of "no harm" and "due diligence" on an international scale.

In examining the long-term aspects of this issue, Michael Faure's analysis of risks in carbon capture and storage (CCS) projects plays a crucial role. Faure highlights the problem of uncertain and long-term liability, such as the possibility of CO<sub>2</sub> leakage after many years, and proposes creating an advance insurance fund or financial reserve for future risks, in addition to

compensation for damages. He considers it necessary to apply the "strict liability" criterion to entities working with hazardous technologies, even in the absence of negligence.

Finally, Stephen Stec approaches energy from a national security perspective, emphasizing that the negative impact of energy facilities on the environment is not merely an ecological issue, but a matter of "environmental security." In his view, states must incorporate environmental risks into their security policies when developing energy strategies. He also stresses that energy activities in one country can pose cross-border environmental threats to other nations, highlighting the importance of international cooperation and oversight in such cases. His approach underscores the necessity for stringent control of precautionary measures from the design phase through to operation. These three international approaches complement each other (Sands addressing general principles, Faure focusing on practical financial mechanisms, and Stec examining political and strategic security), indicating the need to review and update existing legal frameworks in line with modern requirements to strengthen environmental accountability.

The above analysis demonstrates that the five types of legal liability in the energy sector - Administrative, Civil, Disciplinary, Economic, and Criminal measures - form a unified system that complements and reinforces one another. This stringent legislative approach, along with the operational activities of regulatory bodies such as the Bureau of Compulsory Enforcement, and ongoing preventive efforts to enhance the legal and social literacy of the population, guarantee the priority of Uzbekistan's policy in achieving fair and rational use of energy resources. Through legal intolerance, the country is creating a sustainable future for its energy system.

## CONCLUSION:

Thus, in general, ensuring environmental safety and establishing responsibility in the energy sector is important not only from a legal perspective but also from practical and strategic standpoints. Philippe Sands and colleagues, based on international legal principles and the "polluter pays" principle, emphasize the liability of the party causing damage and the precautionary obligations of states, which provides a principled approach to preventing environmental harm. Michael Faure takes a technology-specific approach, particularly using CO<sub>2</sub> storage projects as an example, demonstrating the possibilities of reducing damages through the operator's financial responsibility, insurance funds, and compensation mechanisms. Stephen Stec analyzes the impact of energy projects on national security, transboundary environmental risks, and social stability, stating the need to implement precautionary measures and control mechanisms from design to operation. This analysis shows that the three approaches complement each other: Sands provides legal principles, Faure offers financial and technological mechanisms, and Stec addresses security and strategic control. Overall, the most effective strategy for improving accountability for violations of environmental safety requirements in Uzbekistan's energy sector is to combine these three approaches, forming legal and practical solutions through the joint application of international principles, financial mechanisms, and security controls. Thus, these articles, when combined, provide a clear roadmap for strengthening environmental safety and making the accountability system more effective.

Innovative solutions for ensuring environmental safety and strengthening the accountability system in the energy sector are as follows. Firstly, **creating a "dynamic responsibility algorithm"**: in this system, each energy project assesses its environmental impact in real-time using AI and sensor technologies, and automatically establishes liability criteria when the probability of damage is detected. This way, the actions of entities are constantly monitored, and preventive measures are implemented in a timely manner. Secondly, an **"environmental simulation database for energy projects"** - LCA and carbon footprints of all projects are simulated in advance, and based on the results of this process, environmental risks are fully assessed before the project is implemented. This approach has not yet been widely adopted worldwide. Thirdly, an **"eco-responsibility token"** - a blockchain-based financial mechanism: the entity causing damage automatically covers financial liability through the token, which is

used for resource recovery and financing environmental projects. Fourthly, a **"system for preventing transboundary environmental risks through artificial intelligence"**: transboundary risks arising in nuclear, oil, and gas energy projects are assessed in real-time using AI and geospatial technologies, which automatically recommends preventive measures through the system. Fifthly, an **"eco-innovative certification and self-assessment platform"**: each new energy technology and project independently assesses compliance with environmental safety standards based on AI, and projects without certification will not be permitted to be implemented. When these approaches are applied, the possibility of preventing and compensating for damages, as well as implementing energy projects sustainably and safely, increases.

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