INTERNATIONAL JOURNAL OF TECHNOLOGY AND ACADEMIC RESEARCH

ISSN: 2224-6878 | Pakistan Volume 6, No. 10.

IF: 14.91 | 2026 http://waerasia.org/index.php/ijtar

MECHANISMS FOR IDENTIFYING AND ELIMINATING CORRUPTION-RELATED FACTORS IN ENERGY CONSERVATION

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doi:https://doi.org/10.5281/zenodo.23674962

Abstract: This article examines mechanisms for identifying and eliminating corruption-related factors in energy conservation and proposes amendments and additions to existing sector-specific legislation. The recommendations are based on an analysis of international practices, including the U.S. Department of Energy's standardized procedures for quantifying and verifying savings under performance-based contracts and the United Kingdom's Energy Savings Opportunity Scheme (ESOS), under which energy audits are based on 12 months of verifiable energy data.

Through a comparative legal analysis, the article establishes that energy-sector legislation already encompasses the institutions of energy management, auditing, monitoring, oversight, metering and information systems. It argues that the principal task of further legal reform is not to introduce additional broad declaratory principles, but to transform existing institutions into processes that can be verified and audited from the standpoint of corruption risks.

Keywords: energy sector, corruption, government programmes, investment projects, budgetary funds, subsidies, energy auditing, energy assessment, energy conservation, offences, risks, international experience, recommendations.

In legally assessing corruption risks in energy conservation and energy efficiency, existing rules should be viewed not merely as a collection of formal obligations, but as an integrated regulatory framework covering decision-making, data generation, financing, auditing, procurement and verification of results.

The Law of the Republic of Uzbekistan of 7 August 2024, "On Energy Conservation, Its Rational Use and Improving Energy Efficiency", establishes the basic legal framework for the sector, enshrines legality, accountability, openness and transparency as fundamental principles, and provides for energy management, energy audits, monitoring, metering and a state information system [1].

At the same time, general requirements for the prevention of corruption are established by the Law "On Combating Corruption": identifying and assessing corruption risks and preparing risk maps constitute the legal foundation of preventive risk management. The research problem, therefore, is not that legislation is entirely absent, but rather how general anti-corruption provisions can be applied to technical and economic processes in the energy sector through specific, measurable and verifiable mechanisms. The Organisation for Economic Co-operation and Development (OECD) likewise treats risk identification, analysis, response and reassessment of control effectiveness as an interconnected cycle in its recommendations on public integrity [2, 3].

1. Sector-specific management of corruption risks: from general provisions to functional risks. Although the Law "On Energy Conservation, Its Rational Use and Improving

ISSN: 2224-6878 | Pakistan Volume 6, No. 10.

IF: 14.91 | 2026 http://waerasia.org/index.php/ijtar

Energy Efficiency" establishes the directions of state policy on energy efficiency, the powers of the specially authorised body, and mechanisms for monitoring and oversight, it does not expressly establish, at the legislative level, a sector-specific matrix for identifying corruption risks across the stages of an energy project's life cycle. In practice, such risks arise not only during procurement, but also when justifying needs, establishing baseline consumption, selecting an auditor, granting subsidies, amending contracts and accepting completed works or facilities.

European Union Energy Efficiency Directive (EU) 2023/1791 establishes an approach to energy management linked to consumption levels and risk: enterprises with average annual energy consumption exceeding 85 TJ (terajoules) must implement an energy management system, while enterprises consuming more than 10 TJ that do not have such a system must undergo an energy audit. Under Singapore's Energy Conservation Act, certain industrial entities whose energy consumption exceeds the 54 TJ threshold must register, submit periodic reports, implement energy management practices and appoint an energy manager. In these models, oversight is differentiated according to the scale of energy consumption and institutional risk, rather than being applied uniformly to every entity [4, 5].

In Uzbekistan, it would be appropriate to supplement the general methodology for assessing corruption risks with a sector-specific annex linked to the Law "On Energy Conservation, Its Rational Use and Improving Energy Efficiency". The annex should identify risks, indicators and control measures at each stage of the following chain: (1) planning; (2) auditing; (3) financing/subsidies; (4) procurement; (5) implementation and acceptance; (6) measurement and verification; and (7) monitoring. Risk levels should be differentiated according to factors such as the size of the budget or investment, discretion in decision-making, asymmetry of technical information, conflicts of interest, affiliation between parties and the possibility of independently verifying information.

2. Independence of energy audits and the legal status of auditors. Energy audit findings may form the basis for subsequent technical decisions, investments, subsidies or energy service contracts. Accordingly, possession of a formal professional qualification certificate does not automatically guarantee an auditor's economic and functional independence. Affiliation with the audited entity or an equipment supplier, economic dependence on repeat assignments, or designing a technical solution and then evaluating its effectiveness oneself may compromise impartiality. Although the procedure for conducting energy audits in Uzbekistan is regulated in detail by Cabinet of Ministers Resolution No. 690, corruption risks persist in practice [6].

For example, 35 employees in the sector were held accountable for fraud and bribery connected with the reduction or cancellation of natural gas debts. In one case, a technician from the residential customer service unit of the Samarkandshahargaz department was apprehended while extorting UZS 2.5 million in exchange for deleting a citizen's natural gas debt of UZS 5 million from an electronic database [7].

Article 11 of the EU Directive requires energy audits to be conducted independently and cost-effectively by qualified or accredited experts; Annex VI requires audits to rely on up-to-date, measured and traceable data. Under the Republic of Korea's Energy Use Rationalization Act, major energy consumers must undergo an energy audit by a designated audit organisation at least once every three years, while the competent ministry may administer and supervise such organisations. Under the United Kingdom's ESOS framework, audit or assessment findings are reviewed by a lead assessor listed on an approved register, an evidence pack is retained, and director-level sign-off is required in certain cases [8, 9, 10].

In addition to professional qualifications, requirements for energy auditors should include criteria of functional independence: disclosure of affiliations; recusal where conflicts of interest

ISSN: 2224-6878 | Pakistan Volume 6, No. 10.

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exist; restrictions on a single entity simultaneously designing, supplying and independently evaluating a technical solution; and selective repeat audits of high-risk projects. These rules should be aligned with the principles of advance disclosure and management of interests under the Law "On Conflict of Interest" [11].

3. Measurement and verification of energy savings: legal reliability of results. A reduction in energy consumption does not necessarily indicate an improvement in technological efficiency. Lower production volumes, ambient temperatures, operating schedules, occupied floor area or changes in product mix may also affect consumption. If the determination of baseline consumption and adjustments for external factors are not based on a uniform methodology, the amount of "energy saved" can be artificially inflated, thereby affecting subsidies, compensation or payments to energy service companies (ESCOs).

The U.S. Department of Energy's guidance on measurement and verification (M&V) for performance-based contracts establishes standard procedures for quantifying and verifying savings under such contracts. The scope of M&V is selected in proportion to expected savings and technical risks. The guidance treats comparisons with post-project consumption, preparation of an M&V plan, post-installation reporting and annual verification as distinct stages [12, 13].

The United Kingdom's ESOS framework requires audits, wherever possible, to be based on 12 months of verifiable energy data, with the calculation or estimation methods used documented in an evidence pack [14].

Uzbekistan should adopt a national methodology for measuring and verifying energy savings. It should specify the baseline period, adjustments for production volumes and weather conditions, reliability of measuring instruments, the hierarchy of data sources, the M&V plan, recalculation procedures, the status of independent verifiers and the retention period for supporting evidence. Cabinet of Ministers Resolution No. 242 of 14 May 2026, "On Ensuring Savings of Electricity and Natural Gas in 2026 by Improving Energy Efficiency in Economic Sectors and Organising the Rational Use of Energy at Sectoral Enterprises", provides an institutional basis for this mechanism through measures aimed at expanding energy audits and electronic energy passports. Under results-based financing arrangements, the relevant portion of a payment should be made only after the verified energy savings have been confirmed [15].

Furthermore, the research findings (based on a survey) identified the following factors contributing to increased corruption risks: weak mechanisms for detecting conflicts of interest (13.1%); insufficient transparency of information about procedures (11.7%); broad discretionary powers of officials (11.0%); inadequate independent auditing and verification (8.6%); and difficulties in verifying technical information by external parties (8.6%).

4. Public procurement: from electronic tenders to "integrity throughout the procurement life cycle". In procuring energy-efficient equipment and services, corruption risks begin not when a tender is announced, but when needs are justified and technical specifications are drafted. Tailoring technical requirements to a particular brand, presenting affiliated companies as independent competitors, setting prices above market levels or increasing contract value through subsequent addenda may occur even where electronic procurement is in place. The Law "On Public Procurement" regulates the entire cycle, from procurement planning to contract performance and monitoring [16].

The Republic of Korea's KONEPS system is designed to integrate the policy and operational stages of public procurement into a single electronic environment. The OECD identifies KONEPS as an advanced model of comprehensive digitalisation of public procurement. Its central legal value lies not merely in moving tender procedures online, but in connecting notices, bids, evaluations, contracts and payment records into a linked chain of data. Article 9 of

ISSN: 2224-6878 | Pakistan Volume 6, No. 10.

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the United Nations Convention against Corruption also requires public procurement systems to be based on transparency, competition and objective, predetermined criteria [17, 18].

High-value procurement in the energy sector should be subject to ex ante technical integrity checks, including a review of technical specifications for brand neutrality; automated cross-checks of bidders' beneficial owners and affiliations; benchmarking against market prices; treating shared IP addresses, founders, telephone numbers or banking details as indicators of possible connections ("red flags"); and separate scrutiny of subsequent changes in contract value and duration. A red flag should serve as a legal trigger for additional examination, not as an automatic finding of wrongdoing.

5. Subsidies and digital platforms: the principle of "one facility – one identifier – one history". An electronic decision to grant an energy efficiency subsidy does not, in itself, guarantee that the equipment has actually been installed at the designated facility, is operational, or has not been counted again under another application. Risks include registering the same equipment at different facilities, falsifying installation certificates, collusion between a supplier and an applicant, or quickly transferring subsidised equipment to another location. Cabinet of Ministers Resolution No. 673 establishes mechanisms for promoting energy services and residential energy efficiency, including the use of a digital platform [19].

Under the Singaporean model, energy efficiency oversight is linked to periodic data collection and institutional accountability: registered corporations report on their energy consumption, implement energy management systems, conduct the relevant assessments and appoint energy managers. Oversight under this approach is based not on a one-off document, but on continuous monitoring of a facility over time. In Uzbekistan, this functional principle could be applied by linking the complete "support history" of subsidised equipment and facilities electronically [20].

A unique identifier should be generated for each facility and item of equipment on the platform. Its cadastral number, equipment serial number, supplier, auditor, subsidy amount, installation date, photographic/geolocation evidence and subsequent monitoring results should be stored in a single electronic passport. Duplicate or contradictory data should generate an automatic risk alert. However, a decision to refuse or recover a subsidy must be based not solely on an algorithmic alert, but on human verification of the facts and consideration of the person's explanation.

6. Reliability of digital data: technological transparency and procedural safeguards. Digitalisation reduces direct interactions that may create opportunities for corruption, but also creates new points of discretion: who enters data, who determines algorithmic parameters, who is authorised to amend records, and whether the history of such amendments is preserved. Accordingly, an "electronic process" is not automatically a "reliable and corruption-free process".

Singapore's Energy Conservation Act establishes specific legal requirements against the falsification of energy consumption data; in particular, registered corporations are required to appoint energy managers and maintain reports and records. Under the United Kingdom's ESOS framework, the evidence pack preserves data sources, calculation methods, audit findings, the lead assessor's conclusions and senior management approval for subsequent review [21]. A common feature of these two models is that legal significance attaches not only to the final result, but also to the chain of evidence leading to it [22].

Minimum legal standards should be established for Uzbekistan's energy efficiency information systems: immutable audit logs; version histories; role-based access controls; two-stage approval of critical data; automated verification against external registers; human review of adverse decisions produced by algorithms; and records of the date, time, responsible person and

ISSN: 2224-6878 | Pakistan Volume 6, No. 10.

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grounds for every system change. When personal data are integrated, purpose-based data minimisation, retention periods and access rights must comply with the Law "On Personal Data" [23].

7. Oversight and liability: from harsher sanctions to certainty and proportionality of enforcement. Increasing fines cannot be the sole preventive measure against violations in the energy sector. If the probability of detecting violations is low, evidence is unreliable, or inspections are not targeted according to available resources, the nominal severity of sanctions may have little practical effect.

Singapore's Energy Conservation Act links reporting, energy management and anti-falsification obligations to legal liability. Under the U.S. performance-based contracting model, M&V serves as a tool for allocating risks and contractually confirming that savings have been achieved; the intensity of verification is tailored to project complexity and risk. These approaches frame oversight not as identical inspections for all entities, but as a legally proportionate response to risk [24].

In Uzbekistan, a signal generated by an automated meter, platform or algorithm should constitute grounds for initiating an inspection, not proof of an offence. Intent, repetition, receipt of benefits, falsification of data and significant harm should be treated as indicators of elevated risk requiring thorough examination and a firm response. For first-time, unintentional technical violations whose consequences have been voluntarily remedied, corrective measures or proportionate sanctions may be considered. Such an approach would direct oversight resources towards the most harmful corruption risks.

8. Legal status of centrally monitored sensors and digital monitoring devices for maintaining indoor temperatures within prescribed limits and controlling indoor climate. The "SMART WARM" utility model, a digitally connected thermometer incorporating a centrally monitored sensor proposed in this study, makes it possible to collect temperature data in real time, detect deviations from prescribed standards, record fuel consumption and provide early alerts of possible misappropriation. However, treating an anomaly detected by a technical device as direct proof of corruption or culpability would be procedurally inappropriate. Under the M&V approach, measurement data are an important source for verifying savings, but must be assessed in conjunction with project conditions and external factors [25].

The Singaporean model also combines measurement, periodic reporting, a designated energy manager and documentation within a single energy management system. Thus, the legal evidentiary value of a digital sensor depends on its measurement accuracy as an independent measuring instrument, the integrity of its data and the possibility of subsequent verification.

Accordingly, when buildings belonging to public organisations, including social sector institutions, are constructed, reconstructed (modernised) or extensively renovated, equipping them with centrally monitored sensors that maintain prescribed indoor temperatures and regulate indoor climate should be established as one of the minimum energy efficiency requirements.

Data received from centrally monitored sensors and other Internet of Things (IoT) devices should be used as red flags for identifying corruption risks. For such data to be relied upon in state oversight, rules should be established concerning metrological verification, calibration intervals, cryptographic data protection, audit logs, timestamps and independent re-verification. Digital technology would thereby become a reliable technical source within an evidentiary framework, rather than an automatic "verdict" on the commission of an offence.

The comparative legal analysis demonstrates that Uzbekistan has established the basic legal framework for energy conservation and improving energy efficiency. Sectoral legislation covers energy management, auditing, monitoring, oversight, metering and information systems. The

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principal task of further legal development is therefore not to multiply broad declaratory principles, but to transform existing institutions into verifiable processes from the perspective of corruption risks.

Rather than mechanically transplanting foreign models, their functions should be adapted to national legislation: risk-based audits and independent experts from the European Union; evidence packs and lead assessors from the United Kingdom; baseline energy consumption indicators, measurement and verification from the United States; energy managers and data integrity from Singapore; and designated audit organisations and integrated electronic procurement trails from the Republic of Korea. In Uzbekistan, these approaches could be combined with a sector-specific risk map, a national M&V methodology, verification of beneficial ownership and affiliations, electronic passports, audit logs and risk-proportionate legal responses.

In light of the foregoing, the following amendments and additions to existing sector-specific legislation are proposed to eliminate corruption-related factors in energy conservation:

1. The legislative instruments governing energy conservation, the rational use of energy and improvements in energy efficiency should provide for the following:

(a) the development of sector-specific measures to identify, assess and minimise corruption risks in energy conservation, the rational use of energy and energy efficiency; coordination of their implementation; and information exchange with relevant public authorities and organisations regarding processes involving high corruption risks;

(b) a requirement that energy savings achieved by projects financed through state budget funds, subsidies, compensation, concessional loans or energy service contracts be confirmed in accordance with the legally prescribed measurement and verification procedures.

For this purpose, baseline energy consumption, adjustments for external factors, the data sources used and calculation methods must be documented, and subsequent re-verification must be possible;

(c) a requirement that energy savings achieved as a result of energy conservation and energy efficiency measures be measured and verified in the manner prescribed by law, and that savings under projects financed through state budget funds, government subsidies, compensation or energy service contracts be supported by independent verification findings;

(d) the conferral of powers on the competent authority to maintain an electronic audit log automatically recording the date, time, person responsible and legal grounds for actions of legal significance performed within an information system; establish a version history retaining earlier versions of amended data; restrict rights to access and modify information according to users' authorisations; inform affected persons of the grounds for automated decisions of legal significance; and ensure the possibility of human review of such decisions;

(e) a provision that anomalous readings and automated risk alerts generated by fuel and energy resource metering devices, automated information systems, digital platforms or other technical means may constitute grounds for state oversight measures. However, an automated risk alert must not in itself be regarded as independent and sufficient proof that a person has committed an offence. A final determination that an offence has occurred should be made only after the technical data, measurement results and other evidence have been examined and the person's explanations taken into account;

(f) a requirement that newly constructed, reconstructed or extensively renovated buildings of public authorities and organisations, including social sector facilities, be equipped, in accordance with applicable technical regulations, with automated dispatching and measuring devices capable

ISSN: 2224-6878 | Pakistan Volume 6, No. 10.

IF: 14.91 | 2026 http://waerasia.org/index.php/ijtar

of remotely monitoring the operating parameters of heating and cooling systems, indoor temperatures and fuel and energy consumption. To permit the use of data generated by these devices in state oversight, compliance with metrological requirements, calibration at prescribed intervals, data integrity and security, and the possibility of independent re-verification of measurement results must be ensured.

2. The Government resolution regulating the organisation and conduct of public procurement procedures should be amended to establish the following requirements for high-value, publicly funded procurement relating to energy conservation and energy efficiency: advance examination of terms of reference and technical specifications to ensure that they do not unjustifiably favour a particular trademark, manufacturer or supplier; verification of the beneficial owners and mutual affiliations of bidders through information systems; comparison of the initial estimated value of the procurement item with market prices; and treatment of amendments to contract value, duration or technical conditions as separate risk indicators.

3. Given that the lack of sufficiently specific and mandatory technical and legal requirements for energy efficiency may create conditions for unjustified expenditure of budgetary funds and corruption risks, it is proposed that a Cabinet of Ministers resolution establish, as a mandatory minimum energy efficiency requirement, the installation of centrally monitored sensors capable of automatically maintaining indoor temperatures within prescribed limits and controlling indoor climate.

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