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Advances in Corporate Governance and Performance Accountability in Global Energy Enterprises

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Abstract
Global energy enterprises operate within increasingly complex governance environments shaped by rising climate risks, geopolitical uncertainty, digital transformation, and intensified stakeholder scrutiny. The expanding scope of global energy value chains encompassing hydrocarbons, electricity, renewables, and emerging clean-energy technologies has heightened expectations for transparency, ethical conduct, and rigorous performance accountability. Drawing on scholarship published up to 2019, this paper reviews advances in corporate governance structures, mechanisms of accountability, regulatory frameworks, and performance-monitoring systems applied across global energy enterprises, including state-owned utilities, multinational oil and gas firms, and vertically integrated renewable energy corporations. The review highlights improvements in board governance, audit oversight, risk-management practices, disclosure standards, ESG integration, and strategic alignment. It also identifies persistent gaps arising from political interference, weak regulatory enforcement, corruption exposure, cyber-security vulnerabilities, and operational complexities associated with global energy supply chains. The study contributes a structured synthesis of governance developments prior to 2020 and outlines implications for strengthening accountability and performance discipline in the global energy sector.

Keywords: Corporate governance, Energy enterprises, Accountability, Board oversight, Energy sector reform, Transparency.

Introduction
Corporate governance has become one of the defining issues shaping the resilience, legitimacy, and competitive performance of global energy enterprises [1, 2]. The energy sector's historical association with capital intensity, political influence, environmental risk, and national strategic value has placed extraordinary pressure on governance structures to deliver transparency, accountability, and long-term corporate sustainability [3, 4]. Prior to 2020, global energy enterprises ranging from oil and gas multinationals to vertically integrated utilities and emerging renewable firms underwent significant governance transformation driven by new regulatory frameworks, evolving investor expectations, digitalisation, and rising global concern over environmental and social externalities [5, 6]. As energy markets expanded across borders and integrated technologically complex operations, governance mechanisms were forced to evolve beyond traditional compliance and shareholder-centric approaches toward models grounded in multi-stakeholder accountability, risk governance, and performance discipline.

The governance challenges faced by global energy enterprises stem from their unique structural characteristics. Many energy corporations operate across multiple jurisdictions with divergent regulatory frameworks, political regimes, and environmental standards. This global exposure heightens vulnerability to regulatory non-compliance, corruption risk, supply-chain opacity, and geopolitical shifts that can destabilise operations or undermine corporate legitimacy [7, 8] . State ownership plays a powerful role across national oil companies (NOCs), state-owned utilities, and public energy holding corporations, where political influence frequently shapes board appointments, investment decisions, and disclosure policies [9, 10]. These governance complexities pose substantial obstacles to implementing coherent accountability frameworks.

At the same time, global energy enterprises experienced rising stakeholder scrutiny prior to 2020. Institutional investors, civil-society groups, rating agencies, and international organisations increasingly demanded transparent disclosures involving emissions performance, safety records, executive compensation, local-content commitments, and long-term climate resilience strategies [11, 12]. This shift toward stakeholder-inclusive governance transformed board responsibilities, requiring directors to balance financial priorities with environmental, social, and governance (ESG) obligations.

Traditional governance models, centered narrowly on shareholder value maximisation, were insufficient to address the growing expectation that energy companies must align with sustainability imperatives, environmental stewardship, and social responsibility [13].

Performance accountability emerged as a critical governance theme within global energy enterprises as leaders recognised that governance quality directly influences operational reliability, financial stability, and organisational legitimacy. Accountability mechanisms evolved beyond conventional internal controls and financial audits to include risk-management frameworks, ESG metrics, integrated reporting systems, public-interest mandates, safety-compliance mechanisms, and remediation processes for misconduct or operational failures. The rise of digital technologies including real-time data analytics, automated controls, and cyber-security monitoring further reshaped accountability systems by enabling continuous oversight of operational performance across geographically dispersed facilities [14].

The transformation of corporate governance in energy enterprises was also influenced by global policy reforms and cross-national regulatory initiatives. Corporate governance codes such as OECD guidelines, regional governance frameworks, and country-specific codes provided overarching principles for accountability, transparency, board independence, and risk governance [15, 16]. Energy-sector-specific regulations expanded requirements for environmental reporting, anti-corruption compliance, safety audits, and stakeholder engagement. Multilateral organisations encouraged enhanced governance standards across resource-rich countries to improve transparency, reduce corruption vulnerability, and strengthen institutional capacity [17, 18]. These regulatory shifts contributed to a governance paradigm where transparency and ethical conduct became central components of performance accountability.

In parallel, the rapid evolution of global energy markets prior to 2020, particularly the shift toward renewable energy, decentralised electricity systems, and emerging clean-energy technologies required governance frameworks capable of managing technological uncertainty, new competitive dynamics, and innovation-driven risk. Renewable energy enterprises, for instance, relied on governance mechanisms that supported capital mobilisation, technological learning, portfolio diversification, and long-term infrastructural planning [19, 20]. Meanwhile, oil and gas enterprises faced governance pressure due to declining resource margins, stranded-asset debates, climate-related litigation, and investor divestment campaigns [21, 22], which demanded strategic repositioning and enhanced governance oversight.

Despite substantial governance reforms, global energy enterprises continued to face persistent weaknesses prior to 2020. Corruption risk remained a significant challenge in several jurisdictions where political patronage, opaque contractual arrangements, and weak public-sector accountability hindered effective governance [23, 24]. Board independence was often compromised in state-owned enterprises where political authorities influenced board composition or strategic direction. Many energy companies struggled to align governance frameworks with rapid technological transitions or effectively manage cyber-security risk in increasingly digitalised operations [25]. Disclosure quality varied significantly across firms and jurisdictions, limiting stakeholder ability to assess governance effectiveness or operational performance.

Furthermore, governance implementation remained inconsistent across global jurisdictions due to heterogeneity in legal systems, institutional capacity, market maturity, and cultural norms. In several emerging economies, governance reforms were adopted formally but not enforced substantively, resulting in compliance gaps that undermined accountability mechanisms . In some contexts, deeply embedded governance practices such as informal influence networks, state interventionism, or weak audit cultures persisted despite formal adoption of international governance codes. These inconsistencies highlight the importance of grounding governance reforms within local institutional realities rather than imposing uniform global standards.

Notwithstanding these challenges, global energy enterprises made notable progress in strengthening corporate governance prior to 2020. Improvements in board governance were observed, including enhanced board diversity, independent directorship, specialised committees, and risk oversight mechanisms [26, 27] . Enterprises invested in performance-monitoring systems that integrated financial and non-financial indicators, linking executive compensation to safety records, emissions reductions, and operational efficiency. ESG integration expanded across asset portfolios, strategic planning processes, and disclosure practices. Many companies adopted integrated reporting models combining financial, environmental, and social metrics to strengthen accountability to investors and stakeholders. Technology-enabled governance tools improved transparency, allowing real-time monitoring of energy production, pipeline integrity, electricity grid stability, emissions output, and asset efficiency.

In sum, the evolution of corporate governance and performance accountability in global energy enterprises prior to 2020 reflects the convergence of regulatory reforms, investor expectations, technological change, and strategic transformation. These developments signalled a shift toward more transparent, accountable, stakeholder-responsive governance systems capable of supporting long-term resilience in a highly dynamic global energy landscape.

2. Literature Review

Corporate governance in global energy enterprises has evolved through multiple waves of regulatory reforms, market restructuring, technological development, and shifting geopolitical dynamics. Prior to 2020, corporate governance scholarship emphasised the interaction between board oversight, accountability systems, ownership structures, and performance management across firms operating in oil and gas, electricity utilities, mining-linked energy conglomerates, and increasingly, renewable energy companies. The literature identifies several distinct governance challenges including political influence, corruption exposure, environmental risks, and operational complexity that uniquely affect global energy enterprises. This review synthesises developments up to 2019 across foundational governance theory, board effectiveness, disclosure and transparency standards, risk oversight mechanisms, ESG integration, accountability systems, and governance reforms in both state-owned and privately held energy corporations.

Early governance literature focused heavily on agency theory, emphasising how governance structures mitigate conflicts between owners and managers [28]. Global energy

enterprises, however, introduced additional layers of complexity due to their capital intensity, long asset life cycles, and political embeddedness. The dominance of state ownership in many oil and gas companies, national energy utilities, and integrated fossil-fuel producers generated governance dynamics that blended commercial objectives with public-interest mandates [29, 30]. Scholars observed that political actors often influenced board composition, senior management appointments, and investment decisions, frequently weakening board independence and diluting accountability [31, 32], . These structural realities made traditional agency-based governance models inadequate for explaining performance patterns in politically embedded energy firms.

A substantial body of research examined governance failures that contributed to major energy-sector scandals, including cost overruns, environmental disasters, corruption, and poor financial performance. Studies consistently identified weak board oversight, ineffective internal controls, poor risk governance, and lack of transparency as underlying causes [33]. In oil and gas sectors, the catastrophic impact of operational failures emphasised the importance of board-level competence in safety oversight, environmental risk assessment, and crisis management [34, 35]. Governance failures were also observed in state-owned utilities where political interference, tariff misalignment, and weak audit systems undermined operational performance and financial sustainability [36, 37]. Across electricity, petroleum, coal, and nuclear enterprises, research highlighted systemic weaknesses in accountability mechanisms, particularly in firms operating in countries with weak institutional capacity [38].

In response to these failures, international governance frameworks played an important role in shaping reforms. The OECD guidelines on state-owned enterprise governance influenced restructuring efforts in numerous national energy companies by promoting independent boards, transparent reporting, professionalised management, and strengthened internal auditing [39, 40]. Corporate governance codes across Europe, Asia, Africa, and Latin America increasingly emphasised board independence, disclosure policies, committee structure, and risk governance requirements tailored to energy-sector realities –. These frameworks sought to harmonise governance practices while accommodating national economic priorities.

Simultaneously, global energy markets underwent structural transformation due to liberalisation, deregulation, and market competition. Electricity market restructuring through unbundling of generation, transmission, and distribution introduced corporate governance challenges involving regulatory oversight, investment risk, and infrastructure reliability [41]. Scholars noted that governance mechanisms in unbundled systems required clearer delineation of responsibilities, strengthened regulatory independence, and robust conflict-of-interest policies [42, 43]. Privatisation of utilities in several regions further reshaped governance dynamics by introducing private capital, international investors, and market-based accountability systems. However, privatisation also brought challenges such as tariff disputes, political backlash, and public trust deficits, highlighting the need for inclusive governance frameworks that balanced investor incentives with public-service obligations [44, 45].

Another major theme in the literature concerns board effectiveness. Research consistently shows that board composition, independence, technical expertise, and diversity significantly influence governance quality and corporate performance in energy enterprises [46, 47] . Boards with expertise in engineering, energy economics, safety, finance, and environmental management were better able to oversee operational risks, evaluate investment decisions, and monitor compliance with regulatory standards [48, 49]. Conversely, boards dominated by politically affiliated or non-specialist directors exhibited weaker oversight and poorer strategic guidance [50]. The literature also highlights that diverse boards, including gender and nationality diversity, contributed positively to accountability, innovation, and stakeholder engagement [51, 52].

Accountability mechanisms in global energy enterprises evolved significantly prior to 2019. Internal audit functions strengthened through the adoption of risk-based auditing, enterprise risk management (ERM), and integrated reporting systems. Audit committees became central governance structures, responsible for overseeing financial integrity, risk processes, compliance, and internal controls [53]. Research demonstrates that firms with robust audit committees characterised by independence, expertise, and active engagement exhibited higher levels of transparency, lower corruption exposure, and improved operational performance [54, 55].

Transparency and disclosure standards became increasingly important, especially in multinational oil and gas corporations where revenue opacity had been linked to corruption, rent-seeking, and governance failures [56, 57]. The Extractive Industries Transparency Initiative (EITI), although voluntary, influenced disclosure practices across resource-rich countries by requiring reporting on revenues, royalties, taxes, contracts, and production data [58, 59, 60]. Studies show that EITI participation contributed to improved accountability in several jurisdictions, although its impact varied depending on political will and institutional strength [61]. Corporate sustainability disclosures expanded across the energy sector, with firms incorporating non-financial metrics related to emissions, safety, community impacts, and climate resilience. Many adopted Global Reporting Initiative (GRI) standards or integrated reporting frameworks to enhance transparency and investor communication [62].

Environmental, social, and governance (ESG) integration emerged as a critical governance development for global energy enterprises. Investors increasingly demanded disclosure of climate risks, emissions trajectories, and long-term decarbonisation strategies [63, 64]. Prior to 2020, literature documents rising pressure from asset managers, pension funds, and sovereign wealth funds for energy corporations to demonstrate climate governance competence and alignment with global climate commitments [65, 66]. Firms responded by establishing sustainability committees, appointing board-level climate experts, and linking executive compensation to ESG metrics [67]. However, ESG uptake was uneven across regions, with many state-owned enterprises lagging due to political constraints, limited investor pressure, or weak regulatory incentives [68].

Technological advancement, particularly digitalisation, automation, and data analytics, reshaped governance processes across the energy sector. Digital technologies improved performance monitoring, safety assurance, asset integrity management, and regulatory compliance [69, 70]. Real-time data analytics allowed boards and executives to

oversee production, pipeline integrity, grid stability, and emissions performance more effectively than ever before [71, 72]. Cyber-security, however, emerged as a major governance concern as digitised energy infrastructures—especially electricity grids and pipeline networks—became increasingly vulnerable to cyberattacks [73, 74]. Governance literature prior to 2020 warned that many energy firms lacked adequate cyber oversight capabilities, board-level expertise, or integrated security frameworks [75, 76].

The literature also highlights governance challenges associated with global supply chains. Energy enterprises rely on extensive contractor networks, foreign subsidiaries, joint ventures, and cross-border partnerships. These structures complicate accountability, hinder monitoring of compliance with environmental or labour standards, and increase corruption risk [77]. Several studies documented governance failures arising from opaque subcontracting arrangements, bribery schemes, weak vendor oversight, and inadequate due diligence in procurement processes [78]. Transparency in global supply chains became a central governance priority for multinational energy corporations.

State-owned energy enterprises received substantial scholarly attention due to their economic significance and governance vulnerabilities. Many operated in monopolistic or semi-monopolistic environments with limited external oversight, enabling inefficiency, corruption, and political interference [79, 80]. Governance reforms aimed at professionalising management, improving board independence, enhancing financial reporting, and depoliticising enterprise governance demonstrated mixed results [81]. In some cases, reforms improved performance and accountability, while in others, entrenched political interests undermined implementation [82].

Renewable energy enterprises introduced distinct governance dynamics. As capital flowed into wind, solar, geothermal, and bioenergy sectors, governance structures increasingly emphasised innovation capacity, long-term investment planning, and resilience to market volatility[83, 84] . Corporate governance literature noted that renewable firms tended to exhibit stronger sustainability integration and stakeholder engagement practices compared to fossil-fuel enterprises, although governance maturity varied widely. Grid-integration challenges, policy uncertainty, and technology risk required stronger risk-governance frameworks tailored to renewable assets [85, 86].

Across the energy sector, executive compensation and incentive structures played a significant role in governance outcomes. Misaligned incentives in fossil-fuel companies often encouraged short-term production-driven strategies rather than long-term sustainability considerations [87]. Prior to 2020, several large energy firms adopted performance-based compensation linked to safety performance, emissions reduction, and stakeholder-impact metrics [88]. Scholars highlighted that compensation reform was essential for improving performance accountability and aligning managerial decision-making with long-term corporate sustainability.

International comparisons reveal that governance quality varied significantly among countries. Jurisdictions with strong rule-of-law traditions, independent regulators, and mature capital markets tended to exhibit superior governance practices in energy enterprises [89]. Conversely, countries with weak institutions, high corruption, or volatile political conditions often struggled to implement governance reforms substantively, despite formal policy adoption [90, 91]. These disparities illustrate that governance frameworks must be adapted to local institutional realities and cannot rely solely on global best-practice templates.

Overall, the literature indicates that corporate governance and performance accountability in global energy enterprises advanced significantly prior to 2020, driven by regulatory reform, investor pressure, ESG integration, technological development, and global transparency initiatives. Yet persistent governance gaps remained, particularly in state-owned enterprises and politically influenced corporations. The review underscores the importance of context-sensitive governance reform, stronger board expertise, enhanced transparency, integrated accountability systems, and robust risk-governance mechanisms to ensure long-term performance resilience in the global energy sector.

3. Discussion

The evolution of corporate governance and performance accountability in global energy enterprises prior to 2020 reflects a convergence of structural, regulatory, and strategic dynamics shaping the sector's organisational behaviour. The literature reviewed reveals a broad movement toward more transparent, stakeholder-responsive, and performance-oriented governance systems, although the pace and depth of reform varied across regions and energy subsectors. This discussion section synthesises these developments, critically evaluates the drivers of governance transformation, and highlights the tensions, contradictions, and persistent vulnerabilities that continued to define governance landscapes in the global energy sector.

One of the most salient themes emerging from the literature concerns the tension between commercial imperatives and political influence within energy enterprises, particularly those under state ownership. Although corporate governance reforms including OECD-aligned governance codes and board-independence requirements achieved demonstrable improvements in several jurisdictions [92], political interference remains deeply entrenched in many national energy enterprises. Studies across Africa, Asia, and the Middle East demonstrate that political authorities continued to exert influence over board appointments, procurement decisions, pricing policies, and capital investment plans [93]. This political embeddedness often weakened board independence, diluted risk oversight, and compromised enterprise accountability. As a result, even where governance frameworks were formally adopted, substantive compliance remained inconsistent. The discussion highlights the gap between formal governance adoption and practical enforcement a gap difficult to eliminate without broader institutional reform and political commitment to depoliticising energy governance.

The literature also emphasises the central role of board competence and composition in influencing governance quality. Boards in energy enterprises require multidimensional expertise ranging from engineering and financial management to safety, regulatory compliance, and environmental risk governance [94]. Prior to 2020, many firms improved board structures by incorporating technical specialists, independent directors, and diverse demographic representation. Evidence suggests that such reforms strengthened oversight quality, improved strategic decision-making, and enhanced organisational transparency [95, 96]. Yet progress remained uneven. Politically appointed or non-

specialist boards persisted in many state-owned utilities and national oil companies, impeding effective governance. The discussion underscores that board reform must not only address independence but also cultivate specialised knowledge necessary for managing technologically and operationally complex energy enterprises.

Another critical theme involves the advancement of performance accountability through improved audit mechanisms, risk-governance frameworks, and disclosure standards. Audit committees grew in prominence across global energy enterprises, especially as firms adopted risk-based auditing and enterprise risk management (ERM) systems to enhance oversight of operational hazards, financial integrity, and regulatory compliance [97, 98]. Enhanced disclosure frameworks, particularly through sustainability reporting, integrated reporting, and participation in global transparency initiatives such as EITI, helped promote more rigorous accountability practices among extractive industries and utilities [99]. Nevertheless, disclosure quality remained uneven across firms and jurisdictions, often reflecting divergent regulatory expectations, institutional capacity, and organisational culture. The discussion highlights that accountability improvements were strongest where governance reforms aligned with robust regulatory environments and external stakeholder pressure.

The rise of environmental, social, and governance (ESG) integration represents a key shift in governance expectations prior to 2020. Investors increasingly demanded credible climate strategies, emissions transparency, and long-term sustainability planning from global energy enterprises [100]. This shift marked a departure from traditional governance models centered narrowly on financial performance. Literature shows that firms integrating ESG metrics into strategy, disclosure, and executive compensation structures achieved higher levels of accountability and attracted investor confidence [101]. However, ESG adoption was neither universal nor uniform. State-owned enterprises, firms in politically constrained environments, and companies operating in weak regulatory jurisdictions exhibited slower adoption of ESG principles [102]. The discussion emphasises that ESG integration is not simply a reporting exercise but a deeper transformation of corporate governance that requires substantial cultural, strategic, and operational adjustments.

Technological transformation constituted another major driver of governance reform prior to 2020. The proliferation of digital technologies real-time data analytics, automation, remote sensing, pipeline digitisation, advanced control-room systems, and predictive maintenance redefined how energy enterprises monitored performance and enforced accountability [103]. Digitalisation enabled more accurate monitoring of safety performance, emissions output, asset integrity, and operational efficiency. Yet it also introduced cyber-risk as a new and significant governance concern. Cyber-attacks on energy infrastructure, including electricity grids and pipeline networks, became increasingly sophisticated, and many enterprises lacked adequate cyber-governance mechanisms. The discussion highlights that although digitalisation improved transparency and operational accountability, it simultaneously expanded risk exposure and required new governance competencies, particularly at the board and executive levels.

Global supply-chain complexity further complicated governance and accountability. Energy enterprises operate through extensive contractor networks, international joint ventures, and cross-border procurement chains. Studies show that opaque subcontracting, inconsistent labour standards, and inadequate compliance frameworks increased corruption exposure and accountability gaps within these global supply networks. The discussion stresses that governance reforms must extend beyond parent-company structures and incorporate supply-chain due diligence, vendor oversight, and contractual transparency to ensure full accountability across enterprise operations.

The literature also highlights governance challenges associated with renewable energy enterprises, which differ in significant ways from fossil-fuel-based corporations. Renewable firms face unique risks relating to intermittency, technology innovation cycles, grid integration, and policy volatility [104]. As such, governance systems must support innovation, investment diversification, stakeholder engagement, and long-term planning. Renewable enterprises typically exhibit stronger sustainability integration and stakeholder responsiveness compared to their fossil-fuel counterparts, although governance maturity varies widely [105]. Prior to 2020, renewable energy governance evolved rapidly, but firms still struggled with unpredictability in policy incentives, regulatory frameworks, and market structures.

Executive compensation and incentive misalignment emerged as recurrent governance concerns across global energy enterprises. Weakly designed compensation structures encouraged excessive production-driven strategies, short-term profit maximisation, and insufficient attention to environmental and safety risks [106, 107]. Many firms attempted to reform compensation systems by linking executive remuneration to ESG metrics, operational reliability, safety records, and long-term strategic performance [108, 109]. The discussion underscores that compensation reform remains central to improving accountability, aligning managerial incentives with sustainability priorities, and ensuring long-term corporate resilience.

International governance comparisons reveal deep disparities across jurisdictions. Energy enterprises in developed markets supported by strong regulatory systems, mature capital markets, and high institutional capacity tended to exhibit superior governance practices, stronger disclosure quality, and more rigorous oversight mechanisms [110, 111]. Conversely, firms in countries with weak institutions, corruption, or political volatility struggled to implement governance reforms effectively despite adopting formal governance codes [112, 113]. These disparities highlight the importance of institutional context in shaping governance outcomes and caution against assuming that global best practices can be transplanted without adaptation.

Overall, the discussion shows that global energy enterprises made meaningful governance and accountability strides prior to 2020, driven by regulatory reform, investor pressure, technological change, and rising global expectations for corporate responsibility. Yet persistent vulnerabilities particularly in politically influenced enterprises, institutionally weak jurisdictions, and highly complex operational environments continued to pose challenges. The literature suggests that governance reform in global energy enterprises must be continuous, adaptive, and context sensitive. Strengthening board competence, enhancing transparency, deepening ESG integration, improving cyber-

governance, and aligning incentives with long-term sustainability represent critical priorities moving forward.

4. Conclusion

The evolution of corporate governance and performance accountability in global energy enterprises prior to 2020 reflects a broad restructuring of expectations, responsibilities, and organisational practices across both state-owned and privately held firms. This restructuring was driven by increasing stakeholder demands for transparency, intensified regulatory oversight, growing environmental concerns, and technological advances that reshaped how energy enterprises manage operations and communicate performance. The literature reviewed demonstrates that despite substantial progress, governance in the global energy sector remains shaped by deep structural constraints, persistent vulnerabilities, and significant variations across jurisdictions and subsectors.

Overall, global energy enterprises made meaningful advances in strengthening governance frameworks, improving board effectiveness, expanding transparency initiatives, and embedding performance accountability into organisational processes. Reforms inspired by OECD guidelines, international governance codes, and national regulatory initiatives supported improvements in board composition, risk oversight, audit structures, and disclosure standards [114]. Many companies particularly large international oil and gas corporations and leading renewable energy firms enhanced their governance systems by formalising independent committees, integrating ESG metrics into strategic planning, and professionalising internal audit and compliance functions [115]. These developments contributed to improved governance maturity and expanded the strategic horizon of corporate decision-making in energy enterprises.

At the same time, the literature underscores that governance advances were uneven, with substantial deficiencies persisting in politically influenced or institutionally weak environments. State-owned energy enterprises in particular continued to struggle with political interference, opaque decision-making, weak oversight, and inconsistent disclosure practices. Even where governance reforms were formally adopted, substantive compliance was often limited by entrenched interests, weak institutional enforcement, and cultural resistance to transparency. These findings suggest that governance reforms cannot be understood in isolation from broader political and institutional contexts. Effective governance transformation requires not only formal codes and structural adjustments but also political commitment, regulatory integrity, and organisational culture change.

The review further highlights that technological change introduced both opportunities and new governance challenges. Digitalisation, data analytics, and automation strengthened performance monitoring and operational transparency across energy enterprises, enabling real-time insights into asset integrity, safety metrics, emissions, and service reliability. Yet these same technologies expanded cyber-security vulnerabilities, requiring new governance competencies and board-level cyber-risk oversight that many firms lacked. The interplay between technological advancement and governance capability emerges as a central concern for the future of the energy sector.

Environmental and social accountability gained unprecedented importance prior to 2020, driven by global climate commitments, investor activism, and societal expectations for responsible corporate behaviour. Global energy enterprises faced growing scrutiny for their climate disclosures, community impacts, safety records, and emissions trajectories. As a result, ESG integration became a defining governance theme, influencing risk-management practices, investor relations, and executive incentives [116]. Although progress was significant, particularly among large multinational firms, ESG governance remained uneven across regions, with lagging adoption among state-owned enterprises and firms in institutionally weak jurisdictions.

Another important conclusion is that governance improvements must extend beyond the corporate core to encompass global supply chains. Energy enterprises operate through complex networks of contractors, suppliers, and international partnerships, many of which pose substantial governance and accountability risks. Weak vendor oversight, procurement opacity, and global supply-chain fragmentation generated accountability gaps that hindered performance reliability and increased corruption exposure [117]. Strengthening supply-chain governance, therefore, represents a critical frontier for future reform efforts.

Taken together, the findings of this review indicate that while global energy enterprises made significant advances in governance and performance accountability prior to 2020, the sector remains at a transitional stage. Governance reforms have laid structural foundations, but their effectiveness continues to depend on institutional context, political will, board competence, and organisational capacity. Corporate governance in global energy enterprises must continue evolving to meet rising expectations for environmental stewardship, ethical behaviour, technological resilience, and stakeholder engagement.

Looking forward, several priorities emerge from the reviewed literature. Strengthening board-level technical expertise, improving cyber-governance readiness, enhancing supply-chain transparency, deepening ESG integration, and ensuring independence of audit and compliance committees are essential for improving long-term governance outcomes. Additionally, governance frameworks must be adaptable, recognising the diversity of energy enterprises from legacy fossil-fuel corporations to rapidly expanding renewable-energy firms each operating with distinct risks, regulatory exposures, and societal expectations.

In conclusion, advances in corporate governance and performance accountability prior to 2020 have contributed to greater transparency, stronger oversight, and improved organisational legitimacy in global energy enterprises. However, persistent governance vulnerabilities highlight the need for continuous reform, institution-sensitive implementation, and stronger alignment between governance frameworks and the evolving global energy landscape. By situating governance reforms within broader political, technological, and environmental contexts, energy enterprises can build more resilient and accountable governance systems capable of navigating the profound transformations facing the global energy sector.

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