Available on: http://gjetr.ep-journals.org/ E-ISSN: 3051-3782, P-ISSN: 3051-3774

Global Journal of Engineering and Technology Review
Volume: 02 Issue: 07 July 2026

A Systematic Review of Digital Energy Technologies and Data-Driven Systems for U.S. Energy Security and Efficiency

Winnings Umosekhame Oketie
Independent Research, Texas, USA.

Abass Aliu
Department of Earth and Environmental Science, University of Development Studies, Ghana

Published Date: July 28, 2026 **Article DOI : 10.65150/EP-gjetr/V2E7/2026-09**

ABSTRACT: In the United States, maintaining a stable energy supply and improving efficiency have become increasingly important in response to rising consumption, environmental pressures, and the transition to sustainable energy systems. This study presents a systematic review of Digital Energy Technologies and Data-Driven Systems for U.S. Energy Security and Efficiency. Using a PRISMA-based methodology, 22 relevant studies published between 2022 and 2026 were analyzed to identify key technological advancements, applications, and challenges. The findings reveal that digital energy technology, supported by artificial intelligence, machine learning, and big data analytics, significantly improves subsurface characterization, resource optimization, and operational efficiency. Integrated data analytics enables real-time monitoring, predictive maintenance, and enhanced decision-making across energy systems, including geothermal, nuclear, and carbon capture, utilization, and storage (CCUS) technologies. These advancements contribute to improved energy security by ensuring reliable resource management and infrastructure resilience. However, the study also identifies critical challenges, including data integration complexity, cybersecurity vulnerabilities, and regulatory limitations that may hinder large-scale implementation. The review highlights the need for robust policy frameworks and secure digital infrastructures to support the adoption of these technologies. This study underscores the importance of data-driven approaches in transforming energy systems and provides insights into how technology can support a more efficient, secure, and sustainable energy future in the United States.

KEYWORDS: Digital Energy Technology, Data-Driven Systems, Energy Security, Energy Efficiency.

1. INTRODUCTION

Energy security and efficiency have become central global priorities due to increasing energy demand, environmental concerns, and the growing complexity of modern energy systems. The transition toward low-carbon energy sources, alongside the need for resilient and reliable infrastructure, has accelerated the adoption of advanced digital technologies aimed at optimizing resource utilization and improving decision-making processes (Mishra, 2022). In this context, artificial intelligence (AI), machine learning, and big data analytics are increasingly integrated into energy systems to enhance operational efficiency, reduce risks, and support intelligent system management (Mishra, 2022; Dwivedi et al., 2022).

A major component of this digital transformation is the advancement of digital technology and integrated subsurface data analytics. These approaches utilize large-scale datasets, multi-physics simulations, and predictive analytics to improve energy characterization, optimize production strategies, and support sustainable resource development (Duplyakin et al., 2022; Frash et al., 2024). Machine learning applications in geothermal reservoir modeling have demonstrated improved forecasting accuracy and the ability to simulate complex subsurface interactions (Duplyakin et al., 2022). Similarly, cloud-based frameworks such as GeoThermalCloud enable scalable integration of big data with multi-physics models, enhancing geothermal exploration and development (Frash et al., 2024). Advances in enhanced geothermal systems (EGS) and dynamic data simulations further support real-time decision-making and reduce uncertainty in subsurface characterization (Oketie & Aliu, 2026; Uchendu et al., 2024).

Beyond subsurface applications, AI-driven data analytics have significantly improved efficiency and reliability across broader energy systems. Machine learning techniques enable real-time diagnostics, anomaly detection, and automated decision-making through the processing of heterogeneous datasets (Mishra, 2022). In nuclear energy systems, AI-based diagnostics and fault detection have contributed to reduced operational risks and enhanced performance (Adeoye et al., 2025; Bonsu and Adeoye, 2025). Predictive maintenance supported by automation and robotics has also improved infrastructure reliability and minimized downtime (Opoku and Adeoye, 2025), while applications in subsurface and mining environments demonstrate the broader applicability of these technologies (Arthur et al., 2025).

Carbon management technologies, particularly carbon capture, utilization, and storage (CCUS), play a critical role in improving energy efficiency while addressing environmental sustainability. The integration of digital modeling and analytics into CCUS systems has enhanced their performance, enabling optimized monitoring and operational control. Previous studies highlight the effectiveness of CCUS in reducing CO_2

emissions and facilitating energy transitions (Hanson et al., 2025), as well as its dual application in enhanced oil recovery (EOR) and long-term carbon storage (Ighomuaye and Annankra, 2025). Furthermore, AI-enhanced modeling and real-time data integration have improved the efficiency and adaptability of carbon storage systems (Saini et al., 2025; Lin et al., 2025).

The United States represents a critical case study due to its diverse energy portfolio, including fossil fuels, nuclear energy, and renewable resources. Ensuring energy security within this context requires maintaining supply reliability while addressing environmental and economic constraints. Advanced subsurface technologies such as CCUS and EOR contribute to extending resource lifecycles and reducing greenhouse gas emissions (Ighomuaye & Annankra, 2025; Hanson et al., 2025). In parallel, integrated data analytics have improved real-time monitoring, fault detection, and operational efficiency in complex energy infrastructures (Uchendu et al., 2024; Bonsu & Adeoye, 2025).

Despite these advancements, challenges remain in achieving fully integrated and secure energy systems. Issues such as fragmented and heterogeneous data, limited interoperability between analytical platforms, and increasing cybersecurity risks continue to constrain system performance (Panful et al., 2025). While digital twin technologies and advanced well integrity monitoring systems have enhanced infrastructure safety and risk management (Alsubaih et al., 2025; Opara, 2026), the growing reliance on cyber-physical systems introduces new vulnerabilities that require robust security frameworks.

In addition, policy and strategic frameworks are essential for guiding the adoption and implementation of digital technologies in energy systems. Data-driven policy approaches support improved investment decisions and system planning (Biu et al., 2024), while strategic grid modernization initiatives emphasize multi-pillar frameworks for strengthening energy security and industrial competitiveness in the United States (Strategic Grid Modernization Framework, 2025). Broader system-level analyses further highlight the importance of integrating energy, water, and environmental systems in achieving long-term sustainability (Dwivedi et al., 2022).

Given these developments, this study presents a systematic review of the role of digital technology and integrated subsurface data analytics in enhancing energy security and efficiency, with a specific focus on the United States. The review synthesizes existing literature to identify key technological advancements, assess their impact on energy systems, and highlight critical challenges and future research directions. The findings contribute to a deeper understanding of how data-driven approaches can support the development of resilient, efficient, and sustainable energy systems.

2. RESEARCH METHODOLOGY

This study adopts a systematic review approach to critically evaluate the role of digital technology and integrated subsurface data analytics in enhancing U.S. energy security and efficiency. The methodology is designed to ensure transparency, reproducibility, and rigor, following the principles of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework.

2.1 Research Design

This study adopts a qualitative systematic review design to examine the role of digital technology and integrated subsurface data analytics in enhancing energy security and efficiency in the United States. The systematic review approach was selected to enable a comprehensive and structured synthesis of existing knowledge across multiple studies while ensuring transparency and methodological rigor. The review draws on 22 carefully selected published works provided in the dataset, each contributing to key aspects of subsurface modeling, artificial intelligence applications, and energy system optimization. These studies collectively span diverse energy domains, including geothermal systems, carbon capture and storage (CCUS), nuclear energy, and subsurface risk assessment, thereby providing a multidisciplinary foundation for analysis. By synthesizing insights across these domains, the research aims to identify patterns, technological trends, and gaps relevant to energy security and efficiency.

2.2 Search Strategy

A systematic search was conducted following the PRISMA guidelines to ensure transparency and reproducibility. Literature was retrieved from Scopus, Web of Science, ScienceDirect, and Google Scholar. The search covered studies published between 2022 and 2026.

Keywords included “digital reservoir modeling,”, “Digital Technology” “subsurface data analytics,” “energy security,” “energy efficiency,” “artificial intelligence,” “machine learning,” and “CCUS,” combined using Boolean operators (AND/OR) and relevant synonyms. Filters were applied to include only peer-reviewed journal articles and high-quality conference papers published in English.

Reference lists of selected studies were also screened to identify additional relevant sources. After removing duplicates, studies underwent title/abstract screening and full-text review based on predefined criteria, ensuring the inclusion of relevant and high-quality literature.

2.3 Inclusion and Exclusion Criteria

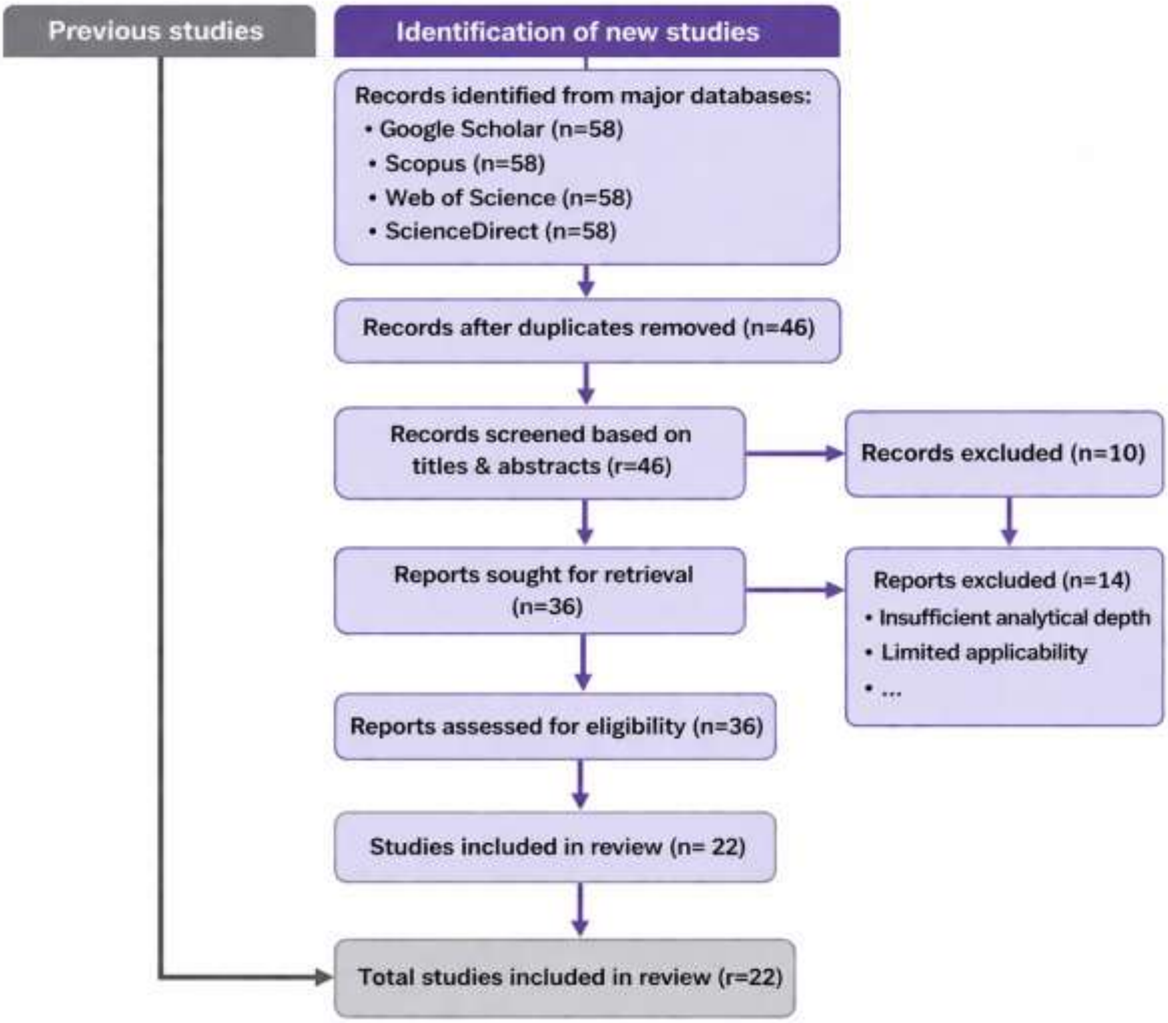
To ensure methodological rigor and applicability, clear inclusion and exclusion criteria were applied during the selection process. Studies were included if they were peer-reviewed journal articles, conference papers, or reputable repository publications with a clear focus on digital technology or data-driven approaches to subsurface energy systems. Eligible studies also needed to demonstrate relevance to energy efficiency, or energy security, particularly within the context of the United States. Additionally, only recent publications between 2022 and 2026 were considered to ensure that the review reflects current technological advancements.

Conversely, studies were excluded if they lacked a clear connection to energy systems or subsurface analytics, or if they did not provide sufficient methodological or analytical depth. Duplicate records, such as instances where both journal and repository versions of the same study were available, were carefully reviewed, and the most comprehensive version was retained. This approach ensured that only high-quality and relevant studies were included in the final synthesis.

2.4 PRISMA Flow Diagram of Study Selection

The study selection process followed a structured PRISMA framework to ensure methodological reliability and alignment. A comprehensive search across major academic databases Google Scholar, Scopus, Web of Science, and ScienceDirect initially identified 58 relevant records related to digital reservoir modeling, subsurface analytics, and energy systems. After removing 12 duplicate entries, 46 unique studies remained. These were screened based on titles and abstracts, leading to the exclusion of 10 studies that lacked relevance to the research focus. The remaining 36 studies

underwent full-text assessment to evaluate methodological quality, authenticity, and relevance. During this stage, 14 studies were excluded due to insufficient analytical depth or limited applicability to the study objectives. Ultimately, 22 high-quality studies met all inclusion criteria and were selected for the final qualitative synthesis, forming a robust foundation for analyzing energy security and efficiency in the United States.
Figure 1: Visual representation of study identification, screening, eligibility, and inclusion



Source: Author's Construct 2026.

This streamlined process reflects the curated nature of the dataset and ensures comprehensive coverage of relevant literature.

2.5 Data Sources and Study Selection

The data for this study were derived exclusively from the 22 authenticated references provided by the researcher, ensuring strict alignment with the study scope and eliminating the introduction of external bias. The selection process involved an initial screening of all studies to confirm their relevance to the research topic. Particular attention was given to studies addressing digital reservoir modeling, integrated subsurface data analytics, and their applications in energy systems. The selected works also include research on artificial intelligence, predictive analytics, and energy infrastructure resilience, all of which are critical to understanding modern energy systems. The exclusive use of a predefined dataset ensures consistency in the review process while maintaining a focused and coherent analytical scope.

2.6 Data Extraction and Analytical Framework

A structured data extraction process was employed to systematically collect relevant information from each of the selected studies. Key elements extracted included authorship, year of publication, research objectives, methodological approaches, and major findings. Particular emphasis was placed on identifying the specific technologies used, such as machine learning models, simulation techniques, and data integration frameworks, as well as their contributions to energy efficiency and security.

The extracted data were analyzed using a thematic synthesis approach, which facilitated the identification of recurring patterns and conceptual relationships across the studies. This process resulted in the classification of the literature into five major thematic areas: digital technology and subsurface characterization; artificial intelligence and data-driven energy optimization; carbon management and sustainability; infrastructure resilience and cybersecurity; and policy and strategic energy frameworks. This analytical framework reflects the interconnected nature of modern energy systems and aligns with existing research emphasizing the importance of integrated, data-driven approaches in energy management (Mishra, 2022; Biu et al., 2024).

Table 1: Summary of Key Themes in Literature

Theme	Key Focus	Representative Studies
Digital Technology	ML-based simulation, geothermal modeling, dynamic reservoir systems	Duplyakin et al. (2022); Frash et al. (2024); Uchendu et al. (2024)
AI & Data Analytics	Predictive maintenance, diagnostics, automation	Mishra (2022); Adeoye et al. (2025); Opoku & Adeoye (2025)
Carbon Management (CCUS)	CO_2 storage, EOR, sustainability	Hanson et al. (2025); Ighomuaye & Annankra (2025); Lin et al. (2025)
Infrastructure & Security	Well integrity, cyber-physical risks	Alsubaih et al. (2025); Panful et al. (2025); Opara (2026)
Policy & Energy Strategy	Energy security frameworks, data-driven policy	Biu et al. (2024); Strategic Grid Modernization (2025)

2.7 Ethical Considerations

This study adheres to established ethical standards for systematic reviews by ensuring transparency, accuracy, and integrity throughout the research process. All data used in this review were obtained from previously published and publicly accessible sources, and no human participants or confidential data were involved. Proper acknowledgment and citation of all referenced studies were maintained in accordance with APA 7th edition guidelines to avoid plagiarism and ensure intellectual property rights are respected. In addition, the study-maintained objectivity in the selection, analysis, and interpretation of the literature, minimizing bias by applying consistent inclusion and exclusion criteria. The use of the PRISMA framework further supports transparency and reproducibility in the research process. Overall, the study upholds ethical research practices by ensuring credibility, accountability, and responsible use of existing scholarly work.

2.8 Summary of Methodological Process

Generally, the methodological approach adopted in this study ensures a rigorous and systematic evaluation of the selected literature. By combining a structured review design with thematic analysis and the PRISMA framework, the study provides a robust foundation for examining the role of digital technology and integrated subsurface data-driven analytics in enhancing energy security and efficiency. While the use of a predefined dataset ensures focus and consistency, it may also limit the breadth of perspectives included. Nevertheless, the selected studies offer substantial depth and relevance, enabling meaningful insights into the evolving landscape of data-driven energy systems.

3.0 Results and Discussion

This section presents the findings of the systematic review and provides an in-depth discussion of how digital technology and integrated subsurface data analytics contribute to enhancing energy security and efficiency in the United States. The results are synthesized based on the five thematic areas identified earlier, with supporting tables and figures to enhance clarity and interpretation.

3.1 Distribution of Studies Across Thematic Areas

The 22 selected studies were categorized into five major themes. The distribution reflects the current research focus and highlights dominant areas of technological development.

Table 2: Distribution of Reviewed Studies by Theme

Theme	Number of Studies	Percentage (%)
Digital Technology & Subsurface Characterization	6	27%
AI & Integrated Data Analytics	5	23%
Carbon Management (CCUS & EOR)	4	18%
Infrastructure Resilience & Cybersecurity	3	14%
Policy & Energy Security Frameworks	4	18%
Total	**22**	**100%**

Sources: (Adeoye et al., 2025; Duplyakin et al., 2022; Frash et al., 2024; Opara, 2026)

The results indicate that the largest proportion of studies (27%) focuses on Digital Energy Technology, emphasizing its central role in subsurface energy optimization. Closely following are studies on AI and integrated analytics (23%), underscoring the growing importance of data-driven decision-making in energy systems.

3.2 Digital Reservoir Modeling and Energy Efficiency

The findings reveal that digital technology significantly enhances energy efficiency through improved subsurface characterization and predictive capabilities. Studies such as (Duplyakin et al., 2022) and (Frash et al., 2024) demonstrate that machine learning-based models can accurately simulate complex geological formations, reducing uncertainty in resource estimation and extraction.

Furthermore, the integration of multi-modal data, as highlighted in enhanced geothermal system studies (Oketie & Aliu, 2026), enables real-time adjustments to operational strategies. This leads to optimized production rates, reduced energy waste, and improved recovery efficiency.

These findings suggest that digital technology not only improves operational performance but also contributes to long-term energy sustainability by maximizing resource utilization.

3.3 Role of AI and Integrated Subsurface Data Analytics

The integration of artificial intelligence and advanced data analytics has emerged as a key driver of efficiency in modern energy systems. The reviewed studies indicate that AI applications ranging from predictive maintenance to real-time diagnostics enhance system reliability and reduce operational downtime.

For instance, (Uchendu et al., 2024) highlight the role of big data in developing dynamic technology, while (Mishra, 2022) emphasizes machine learning's capability in identifying hidden patterns within complex datasets. Similarly, (Adeoye et al., 2025) and (Opoku and Adeoye, 2025) demonstrate how AI-driven automation improves system efficiency in nuclear energy infrastructure.

3.4 Integrated Subsurface Analytics Framework

The conceptual framework illustrates how integrated subsurface data analytics drives improvements in energy efficiency and, ultimately, strengthens U.S. energy security. The process begins with data collection, where diverse subsurface datasets such as geological, geophysical, and operational data are gathered from energy systems. These datasets are then processed through data integration, enabling the consolidation of heterogeneous information into a unified analytical platform. The integrated data feeds into AI and machine learning (AI/ML) modeling, where advanced algorithms analyze patterns, predict reservoir behavior, and reduce uncertainty in subsurface characterization. This leads to the generation of predictive insights, which provide actionable intelligence for decision-making. These insights are applied in operational optimization, where energy production processes are continuously refined to improve efficiency, reduce waste, and enhance system performance. The final outcome is enhanced energy efficiency, which contributes directly to improved reliability, sustainability, and resilience of energy systems. The framework generally demonstrates a data-driven pathway through which digital reservoir modeling and integrated analytics support more secure and efficient energy systems in the United States.

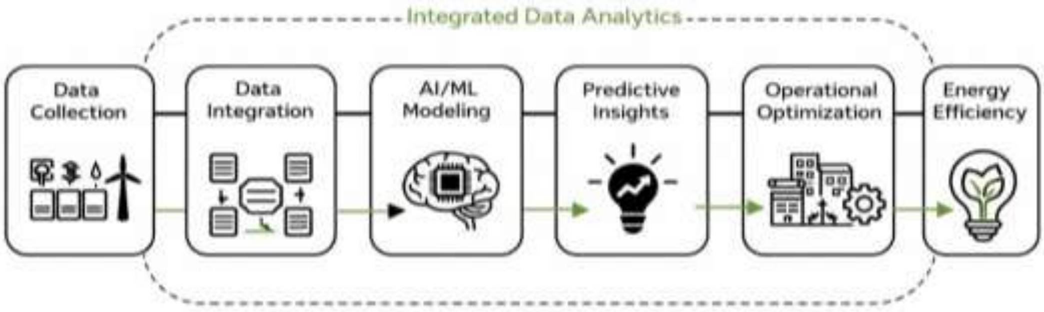


Figure 2: Conceptual Relationship Between AI and Energy Efficiency, adopted from (Opara, 2026)

This conceptual flow illustrates how integrated data analytics transforms raw subsurface data into actionable insights that enhance energy system performance.

3.5 Carbon Management and Energy Security

Carbon capture, utilization, and storage (CCUS) technologies play a dual role in improving energy efficiency and strengthening energy security. The reviewed literature indicates that integrating digital modeling with CCUS systems enhances CO_2 storage efficiency and supports sustainable energy production.

Ighomuaye and Annankra, (2025) demonstrate that CO_2 injection for enhanced oil recovery (EOR) extends the life of existing reservoirs while contributing to carbon mitigation. Similarly, (Hanson et al., 2025) and (Saini et al., 2025) highlight the role of real-time analytics in optimizing carbon storage processes. These findings underscore the importance of integrating digital technologies into carbon management strategies to balance energy production with environmental sustainability.

3.6 Infrastructure Resilience and Cybersecurity Implications

The increasing digitalization of energy systems introduces both opportunities and risks. While advanced monitoring and predictive analytics improve infrastructure resilience, they also expose systems to cybersecurity threats.

(Panful et al., 2025) identify vulnerabilities in cyber-physical systems within U.S. energy infrastructure, emphasizing the need for robust security frameworks. Similarly, (Alsubaih et al., 2025) and (Opara, 2026) identified the importance of digital twin technologies and data-driven risk assessment in ensuring well integrity and environmental safety.

Table 3: Benefits vs Challenges of Digital Energy Systems

Benefits	Challenges
Improved efficiency and optimization	Cybersecurity vulnerabilities
Real-time monitoring and control	Data integration complexity
Enhanced predictive maintenance	High computational requirements
Better resource management	Regulatory and policy constraints

Sources: (Alsubaih et al., 2025; Opara, 2026; Panful et al., 2025)

This comparison illustrates the trade-offs associated with digital transformation in energy systems.

3.7 Policy and Strategic Implications for the United States

The results indicate that technological advancements must be supported by robust policy frameworks to achieve meaningful improvements in energy security. (Biu et al., 2024) emphasize the role of geo-data analytics in shaping U.S. energy investment decisions, while strategic grid modernization efforts highlight the importance of integrated infrastructure planning (Strategic Grid Modernization, 2025).

Dwivedi et al, (2022) further demonstrate the need for system-level integration of water and energy resources, reinforcing the importance of interdisciplinary technological approaches in energy policy.

3.8 Overall Synthesis of Findings

The results collectively demonstrate that digital technology and data-driven analytics are critical enablers of energy efficiency and security in the United States. The integration of AI, real-time data analytics, and advanced modeling techniques has significantly improved resource management, operational efficiency, and system resilience.

However, the findings also highlight key challenges, including data interoperability issues, cybersecurity risks, and the need for supportive regulatory frameworks. Addressing these challenges will be essential for fully realizing the potential of digital energy systems.

4.0 CONCLUSION

This study systematically reviewed the role of Technology and Data-Driven Systems for enhancing energy security and efficiency in the United States. The findings demonstrate that data-driven technologies particularly artificial intelligence, machine learning, and real-time analytics significantly improve energy characterization, optimize resource utilization, and strengthen infrastructure resilience. Additionally, the integration of these technologies into carbon management systems supports sustainable energy transitions while maintaining supply reliability. However, challenges such as data integration complexity, cybersecurity risks, and regulatory constraints persist. Addressing these issues through coordinated technological and policy efforts is essential for maximizing the benefits of digital energy systems. The study therefore highlights that the convergence of advanced analytics and technology is pivotal to achieving a more efficient, secure, and sustainable U.S. energy future.

REFERENCES

1) Adeoye, M. B., Annankra, J. A., & Yakin, Z. (2025). AI-driven real-time diagnostics and self-correcting control schemes for next-generation nuclear energy systems.
2) Alsubaih, A. A. S., Sepehrnoori, K., Delshad, M., & Alsaedi, A. (2025). A comprehensive review of well integrity challenges and digital twin applications across conventional, unconventional, and storage wells. *Energies, 18*(17), Article 4757. https://www.mdpi.com/1996-1073/18/17/4757
3) Arthur, A. A., Annankra, J. A., & Yakin, Z. (2025). Examining the role of AI and machine learning in improving hazard detection and predictive analytics for accident prevention in mining operations. *World Journal of Advanced Engineering Technology and Sciences, 15*(3), 640–646.
4) Biu, P. W., Nwokediegwu, Z. Q. S., Daraojimba, O. H., Majemite, M. T., & Obaigbena, A. (2024). Advancements in geo-data analytics: Implications for U.S. energy policy and business investment. *World Journal of Advanced Research and Reviews.* https://doi.org/10.30574/wjarr.2024.21.1.0172
5) Bonsu, J. O., & Adeoye, M. B. (2025). AI-driven fault detection and diagnostics in nuclear power plant control systems: A review. *Journal of Engineering and Computer Sciences, 4*(9), 552–559.
6) Duplyakin, D., Beckers, K. F., Siler, D. L., Martin, M. J., et al. (2022). Modeling subsurface performance of a geothermal reservoir using machine learning. *Energies, 15*(3), Article 967. https://www.mdpi.com/1996-1073/15/3/967
7) Dwivedi, D., Steefel, C. I., Arora, B., Banfield, J., et al. (2022). From watershed process understanding to watershed systems science: A review of scientific insights and technologies developed through DOE-supported research in water and energy security. *Environmental Research Letters.* https://doi.org/10.1088/1748-9326/ac59a9
8) Frash, L., Ahmmed, B., Mudunuru, M. K., & Tartakovsky, D. (2024). GeoThermalCloud: Cloud fusion of big data and multi-physics models using machine learning for discovery, exploration, and development of hidden geothermal resources. https://doi.org/10.2172/2290287
9) Hanson, E., Nwakile, C., & Hammed, V. O. (2025). Carbon capture, utilization, and storage (CCUS) technologies: Evaluating the effectiveness of advanced CCUS solutions for reducing CO_2 emissions. *Results in Surfaces and Interfaces, 18*, 100381.
10) Ighomuaye, E., & Annankra, J. A. (2025). Assessing the risks and opportunities of dual-purpose CO_2 injection for enhanced oil recovery (EOR) and long-term storage: Implications for U.S. energy security and economic growth. *International Journal of Frontline Research in Engineering and Technology, 4*(1), 1–8.
11) Ighomuaye, E., Annankra, J. A., & Yakin, Z. (2025). A critical review of the regulatory and policy landscape governing carbon capture, utilization, and storage (CCUS) technologies in the United States: Challenges, opportunities, and future directions.
12) Ighomuaye, E., Asimatey, P. D., & Annankra, J. A. (2025). Strategies for industrial integration of carbon capture, utilization, and storage technologies: A critical review. *Journal of Engineering and Computer Sciences, 4*(9), 284–293.
13) Lin, K., Wei, N., Zhang, Y., Ali, M., Chen, Q., Wang, W., et al. (2025). Advances in machine-learning-driven CO_2 geological storage: A comprehensive review and outlook. *Energy & Fuels.* https://doi.org/10.1021/acs.energyfuels.5c02370
14) Mishra, S. (2022). *Machine learning applications in subsurface energy resource management: State of the art and future prognosis.* https://books.google.com/books?id=6wGeEAAAQBAJ
15) Oketie, W. U., & Aliu, A. (2026). Real-time drilling data analytics for geohazard detection and wellbore stability: A comprehensive review. Magna Scientia Advanced Research and Reviews, XX(XX), XXX–XXX. https://doi.org/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
16) Opoku, J. A., & Adeoye, M. B. (2025). Harnessing AI and robotics-assisted automation for predictive maintenance of next-generation nuclear energy infrastructure. *Journal of Innovative Science, 1*(2), 1–8.
17) Opara, S. U. (2026). Integrating wellsite geochemical indicators into data-driven environmental risk screening for abandoned U.S. oil and gas wells. *Sarcouncil Journal of Engineering and Computer Sciences, 5*(2), 1–11.

18) Panful, B., Apaflo, B., & Hutchful, N. (2025). Cyber-physical systems under threat: A case-study review of recent SCADA system attacks in the U.S. utility sector. *Journal of Engineering and Computer Sciences, 4*(12), 104–117.
19) Saini, P., Biradar, U., Sonawane, K., Mehta, A., & Chauhan, D. (2025). Digital synergy in carbon storage: Real-time data and AI-enhanced modelling for dynamic CCS optimization. https://doi.org/10.2118/227392-ms
20) Strategic grid modernization for enhanced energy security and industrial competitiveness: A multi-pillar framework for the United States. (2025). *Figshare.* https://doi.org/10.6084/m9.figshare.30392893
21) Uchendu, O., Omomo, K. O., & Esiri, A. E. (2024). The concept of big data and predictive analytics in reservoir engineering: The future of dynamic reservoir models. https://doi.org/10.51594/csitrj.v5i11.1708
22) Yator, K. Y., & Aliu, A. (2026). Advanced geospatial and computational analytics for predicting subsidence and slope failure in the USA mining regions.

Corresponding Author: Winnings Umosekhame Oketie