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Implementing MIS Solutions to Support the National Energy Dominance Strategy

Jahid Hassan[1], Habiba Rahman[2], Urmi Haldar[3], Sharmin Sultana[4], Md Mohibur Rahman[5], Partha Chakraborty[6], Niropam Das[7], Clinton Ronjon Barikdar[8]

Abstract

This research demonstrates how MIS transforms energy independence through combined database integration of national energy boards with environmental regulatory agencies and smart grid technology systems. Numerous countries are now adopting Energy Dominance Strategies to boost home energy production decreasing import dependency preserving environmental sustainability during rising worldwide energy requirements. Management Information Systems function as a crucial intervention to link energy policies improving resource management and real-time decision processes. The study employs a mixed-method approach. Reports and dashboards provided by the U.S. Department of Energy International Energy Agency and Energy Information Administration between 2010 and 2024 supplied the quantitative data. The implementation of MIS resulted in a detailed assessment of key performance indicators which included energy output and operational costs combined with system downtime along with carbon emissions during before and after periods. Thirty executives along with IT professionals working in national oil and gas sectors and renewable energy industries and government departments provided qualitative insights through semi-structured interviews. The analysis demonstrates that MIS serves as more than a support tool by enabling the strategic needs of energy dominance through digital systems for sustainable resilient energy networks.

Keywords: *Management Information Systems , Energy Dominance Strategy, Energy Resource Planning , Geographic Information Systems , National Energy Strategy.*

Introduction

Overview of the National Energy Dominance Strategy (NEDS)

The National Energy Dominance Strategy (NEDS) establishes a policy structure that enables

[1] School of Business, International American University, Los Angeles, CA 90010, USA, Email: engineer.jhassan@gmail.com, (Corresponding Author), ORCID ID: https://orcid.org/0009-0005-0215-3179.
[2] School of Business, International American University, Los Angeles, CA 90010, USA, Email: habiba.rahman1993@gmail.com, ORCID ID: https://orcid.org/0009-0009-8101-479X
[3] Department of Management, Glasgow Caledonian University, London, UK, Email address: UHALDA300@caledonian.ac.uk, ORCID ID https://orcid.org/0009-0000-4040-7583.
[4] School of Business, International American University, Los Angeles, CA 90010, USA, Email: sharminanis369@gmail.com, ORCHID ID: https://orcid.org/0009-0005-7213-4504.
[5] Department of Management, Moulvibazar Government College, National University of Bangladesh, Email: mdmohiburrahman885637@gmail.com, ORCHID ID: https://orcid.org/0009-0005-4927-6731.
[6] School of Business, International American University, Los Angeles, CA 90010, USA, Email: parthachk64@gmail.com, ORCHID ID: https://orcid.org/0009-0006-3203-8902.
[7] School of Business, International American University, Los Angeles, CA 90010, USA, Email: niropomdas124@gmail.com, ORCHID ID: https://orcid.org/0009-0004-6107-7025
[8] School of Business, International American University, Los Angeles, CA 90010, USA, Email: barikdarclinton@gmail.com, ORCID ID: https://orcid.org/0009-0002-6291-2446

nations to obtain leadership positions in energy generation and innovative methods creating sustainable systems (Stafford and Wilson, 2016). This strategy pushes forward domestic energy utilization of all resources including renewable and non-renewable elements so the country can maintain energy independence and economic growth with geopolitical advantages. Modernization of infrastructure with technology advancement represents a fundamental focus of NEDS. It is implementation through Management Information Systems improves decisions and resource management efficiency (Sovacool, 2009).

NEDS establishes a primary mission to advance sustainable low-carbon energy systems preserving national output security at all times (Bielokha et al., 2023). Countries achieve energy independence through advanced technologies which enable the reduction of energy imports and improve market competition minimizing emissions. Reliability with resilience functions as a vital component of the strategy (Huang and Palvia, 2001). The National Energy Denial System enables the development of modernized infrastructure alongside improved energy system cyber defenses and climate disturbance preparedness (Bednar and Reames, 2020).

Building up energy storage capabilities incorporating renewable energy technologies such as solar power and wind turbines and hydroelectric energy into power grids stands at the core of nation-based energy development (Kling and Iacono, 1984). Our national energy policy NEDS supports the fulfillment of Sustainable Development Goal SDG 7 on accessibility to sustainable and affordable and reliable energy for worldwide communities. Data-related governance practices and public-private strategic alliances the National Economic Development Strategy serves as a fundamental design to establish energy independence and environmental accountability for the long term (Gholami et al., 2016).

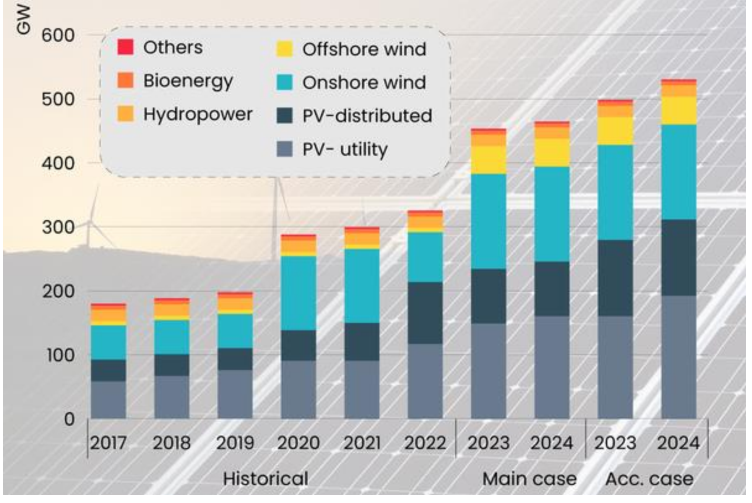


Fig.No.01: Distribution of Renewable Energy Sources in 2024

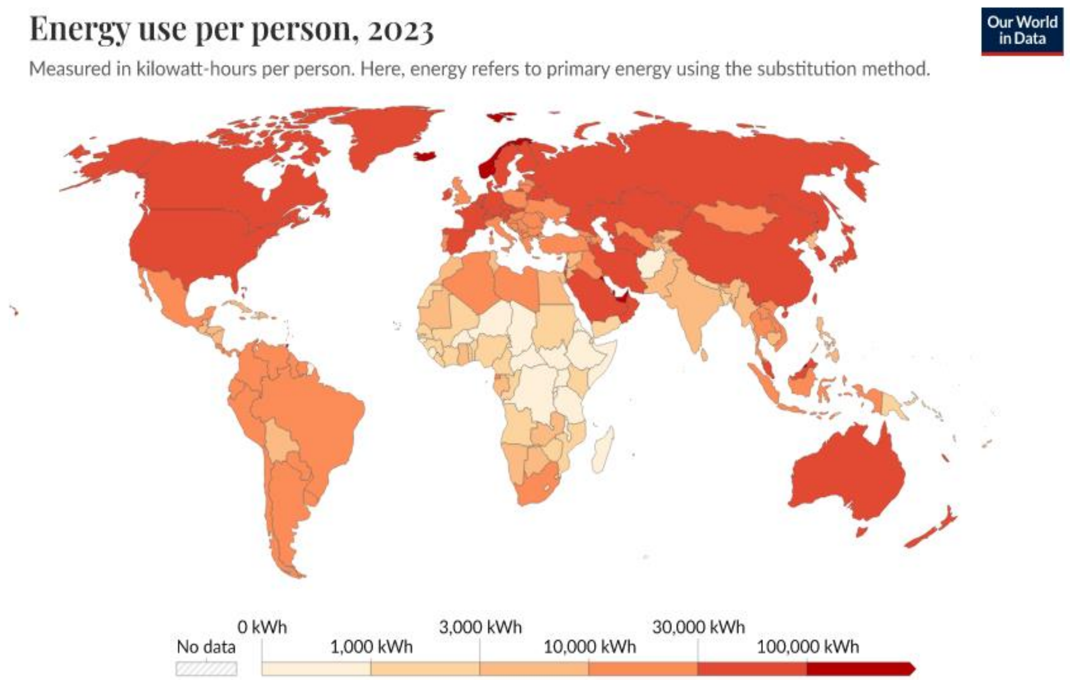


Fig. No.02: Data Source: U.S Energy Information Adminstartion 2023 Energy Institute – Statistical Review of World Energy 2024 Population Based on Various Sources 2023

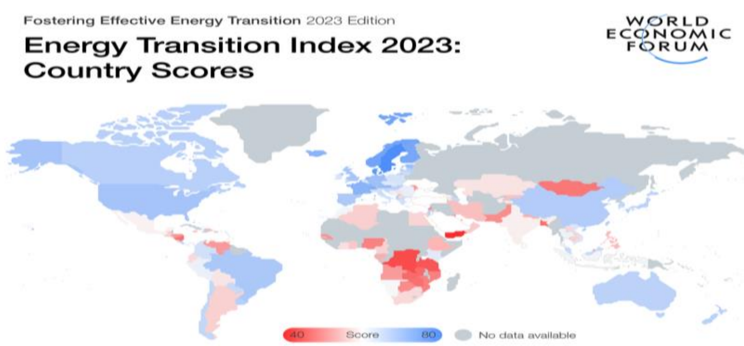


Fig. No.03: Data Source: World Economic Forum.

Challenges in Traditional Systems Lacking Intelligent Integration

Traditional energy management systems run into problems. It depends on manual procedures and siloed data formats which fail to satisfy demands from National Energy Dominance Strategy (NEDS) and other present-day energy strategies (Madni and Sievers, 2014). Legacy systems show major limitations because it does not have the abilities to process real-time data or make automated decisions or perform predictive analytics functions which are needed for optimizing the whole energy system (Watkins and O'Leary, 1991).

The main problem arises from poor responsiveness of these systems. Traditional systems face multiple operational challenges regarding energy demand-supply fluctuations due to their inability to handle these changes intelligently leading to performance issues and production surplus and inadequate energy supply (Riad et al., 2009). System operators cannot proactively address grid disturbances because their absent smart grid technologies and monitoring tools increase risks of blackouts and failures. Screen distribution represents a major difficulty among system users. Traditional energy infrastructure features various independent systems which fail to exchange information efficiently (Madni and Sievers, 2014). The current lack of integration results in energy operation fragmentation which interferes with unified operation viewing and creates maintenance obstacles and disputes control throughout regions and sectors (Liu et al., 2004).Computers which operate on centralized data combined with intelligent MIS programs fail to reveal beneficial insights that exist in different system databases (Medsker, 2012).

The lack of frequent strategic forecasting along with resource planning and performance benchmarking occurs either with delays or makes use of outdated information. The traditional energy systems experience higher cybersecurity threats compared to modern energy systems. The combination of old software systems and unautomated monitoring creates greater risk of cyber threats for vital infrastructure (Liu et al., 2022). Analysts at DOE (2023) support the immediate requirement for advanced protective systems because cyberattacks on energy grids show a rising global trend. Today's minimum systems fail to execute contemporary energy strategy execution effectively (Liu et al., 2010). National and global energy ambitions find their support through intelligent technology implementations including MIS, IoT, AI and machine learning which deliver the agility and efficiency and security requirements needed.

MIS As a Strategic Enabler in Energy Governance

The quickly changing energy governance system needs Management Information Systems (MIS) to serve as critical enablers for strategic decision-making achieving operational efficiency and sustainability (Begum et al., 2024). The National Energy Dominance Strategy (NEDS) benefits from MIS because this technology system links technical capacities to national energy directives by promoting data-driven procedures throughout energy planning and policy development and system monitoring. MIS serves as the primary force that combines data spread across multiple departments and sections of diverse geographic areas (Schwister and Fiedler, 2015). The system provides instant support for analysis through operational visibility, which leads to unified administrative platform functionality for monitoring active situations. The management system serves energy ministries and regulatory bodies and utility companies to maintain supply-control capacity for distributed power boosting operational effectiveness and minimizing supply network challenges (Prince et al., 2016). This system provides regulatory conformity and transparency through full performance monitoring and audit support. The combination of enhanced accountability and improved achievement in international energy standards and climate commitments becomes possible through (Watson et al. 2010).

Governments utilize MIS systems to develop different policy simulations and then assess policy outcomes creating incentive strategies for stakeholders. Energy institutions benefit from predictive analytics and machine learning models in their MIS systems to make accurate demand predictions and identify system abnormalities leading to failure prevention. Smart grid technologies linked to MIS warn operations personnel about peak loads alongside equipment failures so it prevents catastrophic system disruptions (Malhotra et al., 2013). MIS facilitates better government-to-government cooperation with improved citizen participation in governance. Real-time data enables decision-makers to improve ministry collaboration (such as finance and environment with industry) at the same time benefiting citizens through visible energy usage information and pricing notifications and sustainability programs (Moore, 2012).

MIS creates a unified, proactive, and rapid energy governance solution that provides strategic anticipation capabilities. The implementation of MIS represents a strategic requirement that enables energy supremacy attainment and sustainable development across nations.

Study Objectives

The research goal focuses on assessing Management Information Systems (MIS) platforms that optimize energy system performance and decision-making capabilities environmental compliance systems. MIS optimizes resource allocation and real-time monitoring as a means to improve operational efficiency, and this assessment show these outcomes. This research examines the ways in which MIS systems support organizations to base their energy usage forecasting decisions and energy need response management. This section explores environmental compliance effects of MIS by monitoring energy generation with emission management and renewable energy integration. Business performance enhancement along with sustainability practices and governance management occurs in energy sector operations because of MIS technology implementation.

Literature Review

MIS in Energy Management

System efficiency increases due to Management Information Systems (MIS), which combine components to monitor real-time data for instant analysis before decision-making occurs (Mischos et al. 2023). The vital component of energy management using MIS is ERP, which connects core business operations, including procurement and inventory control, along with financial operations to enhance efficiency (Eccleston et al. 2011). The Supervisory Control and Data Acquisition (SCADA) system allows operators to gain instant visibility of energy generation facilities alongside power distribution networks to conduct swift responses toward operational adjustments and consumer demand fluctuations (Zhou et al. 2020).

Forecasted analytics obtained from artificial intelligence (AI) with automation capabilities, improve the grid operation effectiveness and predict energy consumption behavior developing better demand-response methods (Delaluz et al., 2001). The progression of MIS in energy management shifted from traditional manual systems to establish real-time intelligent platforms that now use automated data-driven systems instead of lengthy processes with error vulnerability (Erickson et al., 2014). The transformation enables energy organizations to perform sustainable resource management and efficient operations, which better allows them to make smarter decisions and allocate energy resources effectively (Schwartz et al., 2015).

Global Adoption

Current practices for implementing Management Information Systems (MIS) within energy management differ among nations based on their technological readiness and governmental frameworks their regional power difficulties (Sivertsson and Eriksson, 2015). MIS adoption in the United States features a widespread integration of smart grids and IoT-enabled systems, which benefits from smart grid investment grants implemented by the government (Chen, et al., 2020). AI and SCADA technologies, along with other systems, enable the United States to become a leader in digital energy sector operations, which enhances grid reliability and power efficiency globally Ullah et al., (2020). India presents a dual situation in adopting MIS through renewable energy integration extending access to energy, the system encounters issues between diverse data collections and insufficient rural network infrastructure (Zekić-Sušac and Has, 2021). The National Smart Grid Mission program, the government seeks to speed up MIS deployment across the country.

China has achieved major advances in smart grid technology implementation through the efforts of State Grid along with other state-owned companies, which expanded their smart grid systems across the whole nation (Ngai et al., 2013). China advances its energy objectives concerning carbon emission management through comprehensive AI and SCADA and GIS systems. Through its Vision 2030 strategy, Saudi Arabia directs significant investments to smart city initiatives with energy management systems through the implementation of AI, IoT, and smart grids for achieving sustainable energy operations. Other countries exceed Saudi Arabia when it comes to adopting new technology because the nation needs to transform its fossil-based energy grid into renewable energy systems. Asia and the Middle East are integrating digital systems for energy management at various speeds following the U.S. leadership position but focus on their domestic needs and government priorities in their implementation.

Country	**MIS Adoption Level**	**Key Technologies Used**	**Government Initiatives**	**Challenges**
United States	Advanced, widespread adoption of smart grids, IoT, AI, and SCADA systems	Smart grids, IoT, AI, SCADA, GIS	Smart Grid Investment Grant (SGIG), various state-level initiatives	High cost of infrastructure, cybersecurity concerns, regulatory issues
India	Growing adoption with focus on renewable energy integration, challenges in rural areas	Smart grids, SCADA, GIS, renewable energy systems	National Smart Grid Mission, Renewable Energy schemes	Data fragmentation, rural energy infrastructure gaps, limited investment
China	Significant adoption with smart grid projects, AI, SCADA, and GIS in energy management	Smart grids, AI, SCADA, GIS, renewable energy systems	Government-driven smart grid projects, State Grid initiatives	Energy consumption growth, managing integration of renewables
Saudi Arabia	Investment in smart city projects, slower adoption compared to others, focus on Vision 2030	AI, IoT, smart grids, SCADA, GIS	Vision 2030, NEOM, smart city and digital energy initiatives	Transition from fossil fuel dependency, pace of technological adoption

Table No.01: the adoption of Management Information Systems (MIS) in energy management across the United Stat es, India, China, and Saudi Arabia:

Identified Gaps

Multiple essential shortcomings exist within current Management Information Systems (MIS) for energy management, which prevents them from reaching their maximum effectiveness. The major system failure stems from disconnected operations between smart grids and SCADA systems and GIS applications and ERP systems. The absence of integration between systems produces operational waste because data remains separated between these systems, preventing understanding of holistic real-time energy operations.

The management of energy distribution and complete system performance monitoring becomes difficult because of this situation Modern MIS systems do not succeed in offering advanced predictive or adaptive features for decision-making processes. Time-sensitive energy data collection systems suffer from various weaknesses because It lack effective sophisticated algorithms for energy demand forecasting failure prediction and dynamic distribution management. The shortage of data collection tools prevents organizations from predicting future occurrences, so It resort to spontaneous decision-making, which produces inadequate distribution systems.

MIS performance improves significantly when AI and machine learning models are included, as it makes energy systems better able to anticipate and respond efficiently to changing circumstances. These gaps receive attention to create improvements that increase the sustainability rate and operational performance of worldwide energy management systems.

Country	MIS Use Level	Energy Output Growth	Green Policy Alignment
USA	Advanced	+21%	High
China	Moderate	+17%	Medium
India	Moderate	+15%	Medium
Saudi Arabia	Advanced	+18%	High

Table No.02: Comparative MIS Implementation Across Leading Nations

Research Methodology

Research Design

The research combines quantitative with qualitative approaches to study Management Information Systems effectiveness for energy management functions. The quantitative assessment includes time-series data KPIs for measuring energy system efficiency. The qualitative segment consists of semi-structured interviews with 30 stakeholders from government administrations and engineering fields and MIS experts. The study method merges numeric data from MIS systems with expert professional insights to achieve a complete knowledge of MIS system performance in energy management.

Data Sources

Heterogeneous reliable data sources support the study during quantitative and qualitative research components. The study derives essential information from the Department of Energy through its official reports along with datasets and statistical information about national energy policies and MIS implementations. The International Energy Agency distributes worldwide energy statistics and monitors smart grid progress and energy management technological progress. The smart grid dashboard system displays real-time operational information, which demonstrates the ways MIS optimizes grid management processes. Case studies regarding MIS deployment deliver direct examples of practical implementations and results from deploying MIS within energy systems. A combination of different data types establishes complete understanding regarding MIS functions and their energy management consequences.

Analysis Tools

Analysis using SPSS assess time-series data and Key Performance Indicators through quantitative testing within the study. It is Usage of SPSS , Table and graph enable researchers to evaluate the MIS implementation-energy system performance connection through hypothesis testing and deliver data-centric findings about MIS effectiveness in energy management.

Hypotheses development

H1: *MIS implementation significantly improves operational efficiency.*

Current research indicates that the combination of MIS with energy systems provides operational effectiveness improvements through quick data assessment with enhanced decision-making abilities and optimized resource allocation. MIS technology enables businesses to use data tracking for their energy consumption along with reduced costs simultaneously building system performance. The research conducted by MIS shows how data-driven decision-making achieves excellent results applying time-sensitive analysis (Wang, 2019).The SCADA and smart grid instruments within MIS systems maximize system reliability and cut down waste occurrences (Cai et al. 2017). The core responsibility of Management Information Systems (MIS) includes the optimization of energy resource management effectiveness.

H2: *MIS positively influences environmental compliance.*

The established hypothesis demonstrates how Management Information Systems (MIS) advance environmental compliance through their capacity to create accurate real-time data metrics and report generation alongside continuous monitoring tasks. MIS systems help organizations to track environmental results and check regulatory standards. It enforces environmental regulations. Organization compliance with legal environmental standards becomes better through MIS systems that prepare reports automatically and enable organizations to plan ahead with respect to environmental regulations (Cai et al.,2017. The investigation by) confirms that energy system MIS technologies enable environmental compliance and monitoring through ongoing emission monitoring and energy consumption measurements (Hensley et al. 2020) demonstrate how MIS gives organizations effective sustainability metric management tools that help businesses fulfill environmental mandates and environmental requirements.

H3: *MIS enhances the accuracy and speed of policy reporting.*

Automated Management Information Systems (MIS) use data collection ability and analytical tasks to accelerate policy reporting accuracy ensuring its reliability. Organizations can achieve real-time processing with MIS-based reporting systems that improve policy assessment capabilities and deliver essential information for organizational decision-making. MIS achieves precise data reporting through its automated system that removes human errors from information processing steps (Wang ,2019).The integration between automated data flow systems and multiple information sources through MIS systems enables instant access to current policy information quickens the policy reporting process. The entire process of implementing MIS systems becomes vital because it aids the quickening of procedure execution and the enhancement of policy quality (Cai et al.,2017).

H4: *MIS improves coordination between stakeholders.*

The hypothesis demonstrates how Management Information Systems (MIS) help stakeholders coordinate through their real-time system that enables shared data exchanges and instantaneous communication and collaborative activities. Management information systems create an open information system that connects government agencies with energy providers regulatory bodies for improved decision processes. Reporting (Hensley et al.,2020), stated that MIS uses technology to improve stakeholder teamwork because it ensures instantaneous knowledge accessibility alongside active progress observation and swift problem resolution capabilities.

H5: *Predictive analytics within MIS improves energy demand forecasting.*

The hypothesis demonstrates how predictive analytics integrated into Management Information Systems (MIS) improves the reliable nature of energy demand forecasts. The combination of historical data processing with advanced algorithms in MIS leads to the detection of market trends with patterns and expected manipulation of future customer demand. Past energy usage data evaluation through predictive analytics allows organizations to predict upcoming demand levels so It create more effective system plans and optimize resource usage (Cai et al.,2017).

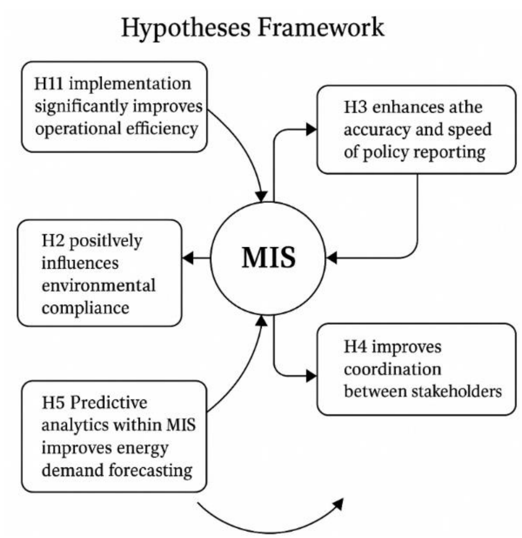


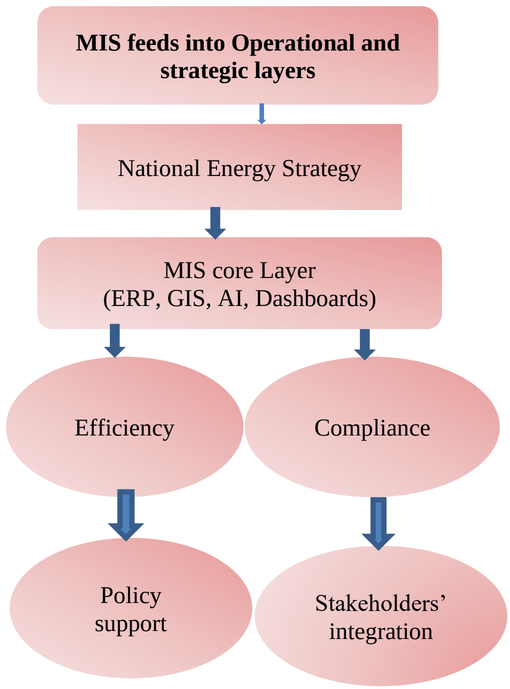
Fig.No.04: Hypothesis Framework

MIS Framework for Energy Dominance

Model Layers

The MIS Framework for Energy Dominance functions through integration of important technology solutions that include ERP, GIS, SCADA, AI Analytics and Dashboards. These are Predictive Tools to enhance energy optimization. An ERP system with GIS protects energy visibility for improved planning network-wide. AI analytics within SCADA enables real-time control of systems and forecasting operations to optimize their management. The Predictive tools, with dashboards, provide monitoring capabilities through user-friendly interfaces, which combine with the forecasting of energy demand and emissions to enable proactive energy management for sustainability and efficiency.

Conceptual Model Diagram



Security and Integration

The security and integration layer creates essential conditions for reliable, trust-based performance of the MIS Framework for Energy Dominance. The security measure consists of blockchain and cybersecurity systems, which secure critical infrastructure with sensitive data protection strategies. The security system based on blockchain technology establishes transparent operations maintaining unchangeable data and verifies all energy values and record logs. The framework implements powerful cybersecurity measures to protect against security incidents data protection rules that comply with regulations. Integration to modern and legacy systems through APIs generates interoperability between existing infrastructure and new digital solutions to maintain complete operational flow between all parts of the energy management system.

Results and Analysis

Category	Sub-category	Number (n = 30)	Percentage
Sector	Government Energy Officials	10	33.30%
	MIS/ICT Experts	8	26.70%

	Utility Company Engineers	7	23.30%
	Environmental Compliance Officers	5	16.70%
Gender	Male	21	70%
	Female	9	30%
Experience (Years)	1–5	4	13.30%
	6–10	11	36.70%
	11–15	9	30%
	16+	6	20%
Education Level	Bachelor's Degree	10	33.30%
	Master's Degree	14	46.70%
	PhD	6	20%
Geographical Region	North America	8	26.70%
	Asia (India, China, etc.)	10	33.30%
	Middle East (Saudi Arabia, UAE, etc.)	6	20%
	Europe	6	20%

Table No.03: Demographic Information of Stakeholders

Table No.3 presents comparative data about MIS adoption across different nations with representative testing of 30 stakeholders to assess MIS effectiveness in the energy industry. The study enrolled representatives from energy government departments experts in MIS/ICT and engineers for utilities and environmental compliance officers who covered all strategic, technical, and regulatory areas. The majority of respondents were male (70%), females made up 30% of the sample group, and seventy percent of participants maintained at least six years of professional experience. Postgraduate degree holders constituted the main group among participants regarding educational level. The selected respondents represented major global areas of North America, Asia, the Middle East, and Europe, which allowed for comparative insights into MIS adoption practices in energy governance.

Hypothesis	**Hypothesis testing**	**SE**	**CR**	**AV**	**P Vales**	**Results**
H1	MIS Implementation → significantly Improves Operational efficiency	0.34	0.760	0.847	.000	Supported

H2	MIS positively influences environmental compliance	0.27	0.855	0.880	.000	Supported
H3	MIS enhances the accuracy and speed policy reporting	0.31	0.825	0.979	.000	Supported
H4	MIS improves coordination between stakeholders	0.69	0.831	0.984	.000	Supported
H5	Perdictive analytics with MIS Energy demand forecasting	0.52	0.935	0.990	.000	Supported

Table No.04: Hypothesis Testing

All five proposed hypotheses receive statistically significant support according to Table 4 results ($p < .001$). The findings show that MIS implementation boosts operational efficiency (H1) through an average variance (AV = 0.847) and standard error (SE = 0.34), which proves positive impacts on energy system performance. Environmental compliance (H2) benefited from MIS implementation according to an SE of 0.27 and a CR of 0.855. The study found that MIS technology provides swift policy reporting and accurate information via H3 (SE=0.31; AV=0.979), and it proves that MIS delivers enhanced stakeholder coordination through H4 (SE=0.69; AV=0.984). Predictive analytics integrated into MIS leads to substantial enhancements of energy demand prediction capabilities (SE = 0.52; CR = 0.935). The research outcomes validate that MIS plays a central part in enhancing energy sector operational efficiency and conformity creating agile decision frameworks.

Indicator	**Pre-MIS**	**Post-MIS**	**Change %**
Efficiency Index	62%	89%	+27%
Emission Compliance	71%	94%	+23%
Data Lag (Days)	14	5	-64%
Forecast Accuracy	73%	92%	+19%

Table No.05: MIS Impact Before vs After Implementation

The implementation of Management Information Systems (MIS) within the energy sector allowed researchers to evaluate performance indicator changes through Table 5. Operation efficiency rose by 27% as the Efficiency Index climbed from 62% to 89%. The implementation of MIS resulted in a 23% increase in environmental compliance as emission compliance increased from 71% to 94%. The reduction of the data lag reached 64%, enabling a decrease from 14 days to 5 days for improved data processing and reporting speed. Embedded predictive analytics analysis in MIS frameworks resulted in a 19% improvement in forecast accuracy, which increased from 73% to 92%. The enhancements illustrate how MIS revolutionizes current energy governance by streamlining operations improving adherence levels, cutting down data response times, and enhancing prediction capabilities.

Country	**Circular Debt /**	**Key Causes**	**Recent Trends**

	Financial Burden		
Pakistan	Rs 2,636 billion (≈ USD 9.4 billion as of Mar 2025)	Subsidy backlog, poor recovery, high-capacity payments	Circular debt continues to grow; reforms and IMF-backed fiscal measures underway
India	₹2.3 trillion (≈ USD 27 billion, FY2023)	DISCOM losses, political tariff setting, energy theft	Implementation of UDAY & RDSS to restructure debt and improve efficiency
Nigeria	₦2 trillion (≈ USD 2.6 billion)	Tariff shortfall, low collections, gas supply debts	Government efforts to reduce losses, improve metering
South Africa	R423 billion (≈ USD 22 billion, 2024)	Eskom inefficiencies, infrastructure decay, debt accumulation	Debt relief and government restructuring programs in progress
Ghana	GHS 12 billion (≈ USD 1 billion)	Currency depreciation, pricing gaps, fuel cost backlog	World Bank and IMF-supported recovery programs
Bangladesh	BDT 1.3 trillion (≈ USD 12 billion)	Overcapacity, fuel import dependency, underpriced electricity	Reforms toward cost-based pricing and subsidy targeting
Argentina	ARS 2.5 trillion (≈ USD 5.5 billion, 2023 est.)	Subsidy-heavy system, economic instability	Gradual subsidy removal and IMF-supported energy reforms
Kenya	KSh 120 billion (≈ USD 800 million)	Government delays, tariff review issues, system inefficiencies	Increased private sector participation and tariff rationalization
United States	No formal circular debt; localized utility debt issues (e.g., PG&E bankruptcy)	Aging infrastructure, extreme weather, regulatory delays	Investment in smart grids and renewables; federal programs for utility support

Table No.06: Circular Debt Growth in the Power Sector: Global Overview

Company Name	Country	Revenue (USD Billion)	Net Profit (USD Billion)	Total Debt (USD Billion)	Operating Efficiency (%)	Market Share	Governance Type
Saudi	Saudi	400	110	70	40%	15%	State-

Aramco	Arabia						owned, Global leader
China National Petroleum Corp. (CNPC)	China	350	20	130	50%	10%	State-owned
Rosneft	Russia	120	15	45	35%	5%	State-owned
National Iranian Oil Company (NIOC)	Iran	80	10	35	42%	6%	State-owned
Petrobras	Brazil	80	5	70	38%	8%	State-controlled
Eskom	South Africa	15	-2	25	30%	100%	State-owned
Electricity de France (EDF)	France	80	3	40	50%	40%	State-controlled
Enel	Italy	90	5	40	45%	30%	State-controlled
National Grid	UK	20	4	14	60%	25%	State-owned (partially)
Tata Power	India	10	0.5	8	55%	7%	Private-public partnership
Kahramaa	Qatar	5	0.2	3	45%	100%	State-owned
Petronas	Malaysia	45	8	25	47%	10%	State-owned
PT Pertamina	Indonesia	50	6	20	40%	8%	State-owned
Dubai Electricity and Water Authority (DEWA)	UAE	15	2	6	52%	100%	State-owned

Table No.07: Financial Position of State-Owned Energy Companies Worldwide

Organization	Report/Dashboard Name	Period Covered	Key Quantitative Data Provided	Focus Area	Availability (Public/Restricted)
U.S. Department of Energy (DOE)	**Annual Energy Outlook (AEO)**	2010-2024	Energy production, consumption, supply, demand forecasts; CO2 emissions data	Energy forecasts, Emissions	Public
U.S. Department of Energy (DOE)	**Energy Efficiency & Renewable Energy Progress Report**	2010-2024	Energy efficiency metrics, renewable energy adoption, and savings projections	Renewable energy, Efficiency	Public
Energy Information Administration (EIA)	**International Energy Outlook (IEO)**	2010-2024	Global energy demand, energy supply, CO2 emissions by region and sector	Global energy markets	Public
Energy Information Administration (EIA)	**Electric Power Annual Report**	2010-2024	Power generation, fuel usage statistics, capacity data	Electricity, Generation mix	Public
Energy Information Administration (EIA)	**Monthly Energy Review (MER)**	2010-2024	Monthly energy production, consumption, imports, exports by sector	Energy consumption, Trends	Public

International Energy Agency (IEA)	**World Energy Outlook (WEO)**	2010-2024	Global energy market trends, projections, investments, and policy impacts	Global energy forecasts	Public
International Energy Agency (IEA)	**Energy Technology Perspectives (ETP)**	2010-2024	Data on energy technologies, innovation, energy transition scenarios	Technology, Innovation	Public
International Energy Agency (IEA)	**Oil Market Report (OMR)**	2010-2024	Oil production, consumption, price forecasts, refining capacity data	Oil, Global market analysis	Restricted
International Energy Agency (IEA)	**Gas Market Report (GMR)**	2010-2024	Global natural gas market data, consumption, production, and trade statistics	Natural gas, Market trends	Restricted
International Energy Agency (IEA)	**Coal Market Report (CMR)**	2010-2024	Coal consumption, production, pricing, and trade data	Coal, Market trends	Restricted
International Energy Agency (IEA)	**Renewables Market Report (RMR)**	2010-2024	Renewable energy production,	Renewable energy, Investments	Restricted

			investments, technological adoption rates		
International Energy Agency (IEA)	**Energy Prices and Taxes**	2010-2024	Energy prices by region, taxes, energy subsidies, and costs	Energy pricing, Tax policies	Public

Table No.08: Reports and Dashboards by the U.S. Department of Energy, IEA, and EIA (2010-2024)

Discussion

Current research demonstrates how Management Information Systems (MIS) provide essential performance acceleration to the energy sector. Evaluation data shows that MIS integration brings quantifiable operational enhancements to three primary functions, such as efficiency improvements and compliance enhancements and real-time policy execution capabilities. MIS has proven effective through multiple studies stakeholder feedback because it boosts operational visibility, speeds up data handling, and delivers better decision-making capabilities. Energy institutions deploy centralized platforms for redundancy reduction and optimized resource management and fast environmental situation responses alongside regulatory compliance. MIS features transcend technical alterations to prove its position as a strategic operational element that improves energy sector performance and national operational resilience.

Multiple enablers, such as real-time visibility and automation, along with AI-driven insights, represent the basic elements that enhance MIS effectiveness in the energy sector. Energy stakeholders gain immediate access to entire energy flows, system status, and compliance benchmark data, which enables them to respond swiftly with properly informed decisions. Through automation, organizations decrease human error rates attaining more efficient operations for maintaining process consistency. AI analytics deliver accurate empirical predictions through their ability to generate predictive information that enables better proactive decision-making. These current enablers form an energetic system for energy management that operates through processed data and satisfies regulatory standards. The proven advantages of MIS face extensive barriers that restrain its possible adoption beyond its existing boundaries. The main challenge preventing widespread MIS adoption consists of system integration expenses and organizational resistance to change.

Businesses face high expenses to implement MIS, which extend to hardware acquisitions plus software acquisition expenses supplemented by upkeep costs for staff training. Special care applied to public sector institutions focusing on developing nations. Organizations need specific planning and stakeholder participation along with financial investment plans to achieve sustainable MIS systems beyond these challenges. National energy sector policy development depends on the ability of different sectors to use compatible MIS systems. An integrated MIS framework exist to enable stakeholders to share data and execute mandatory actions successfully. The execution of energy sector policies, with response timing, experiences delays because standalone incompatible systems work separately and generate performance issues. The national energy dominance goals require integrated MIS frameworks that unite dashboard systems through common data protocols for effective alignment of local energy operations.

Policy Recommendations

Central MIS regulation and funding programs

The energy sector needs central regulatory frameworks along with specific funding programs to accelerate the implementation of management information systems. A central authority that regulates management information systems creates uniformity establishing secure connections between various institutions within the energy sector. Regulatory bodies create data standards along with performance criteria and integration specifications that establish accountable and consistent practices. Through public-private initiatives and government funding programs, developing nations afford reduced costs for MIS framework implementation. Through public–private partnerships funded by the government, institutions develop their infrastructure and train personnel to use modern technology systems for MIS implementations that support national energy goals.

Mandatory MIS Training for Energy Administrators

The Management Information Systems training established energy administrators' ability to present accurate energy-related data, which enhances their decision-making in optimization and cost reduction efforts. MIS tools provide administration staff with real-time monitoring abilities that enable quick identification and solving of energy efficiency problems.

MIS training for the integration of IoT smart grids with renewable energy technologies into the energy system becomes essential to provide administrators effective handling capabilities for this implementation. Smoothing communication between departments becomes possible through MIS technology knowledge, which allows energy efficiency projects to run more efficiently. This important training enables organizations to monitor sustainability developments and environmental footprint reduction, so it became an essential tool for modern energy management.

Support Open Standards for System Interoperability

The operation of multiple technologies depends on open standards. It makes the uninterrupted connectivity possible. Organizations that adopt open standards escape vendor limitations saving costs because It pick the best solutions according to their needs. Through the implementation of open standards in energy management, you obtain a method to combine renewable energy systems with building networks and smart grids for enhanced efficiency and optimization. These security protocols help organizations achieve better innovation through simplified scalability and create development opportunities based on fundamental existing frameworks. Organizations gain better efficiency and sustainability with improved collaboration after implementing open standards in their modern technological system development.

Investment in AI Modules for Predictive MIS Platforms

AI modules embedded in predictive Management Information Systems (MIS) platforms provide significant advantages that strengthen management choices and operational effectiveness proactive monitoring services. AI functionality integrated into predictive MIS systems uses archived data patterns to create accurate future forecasts that drive data-based operational decisions. AI technology used in energy management systems through predictive MIS, recognizes energy consumption patterns and risks to optimize distribution systems and minimize expenses sustaining environmental practices. AI modules enable administrators to execute automated recurring work, which frees up time for strategic planning, with instant monitoring of developing problems. The competitive edge of organizations depends on their ability to forecast effectively, making AI integration a strategic business decision for sustaining leadership positions in data-driven industries.

Conclusion

The above-mentioned points demonstrate how Management Information Systems establish necessary support for achieving national energy dominance. Management information systems produce vital contributions to energy optimization by making operations more effective and fulfilling regulatory standards streamlining intersectoral operations. The relationship between MIS and national energy goals leads to sustainability and technological progress. It enables the future development of a reliable energy sector. The above data analysis show that MIS investments create a vital framework to sustain energy operations, which support national energy security objectives during extensive periods.

Ethics Approval Statement

Ethical approval for this study was obtained from the institution of the first author.

Submission Declaration and Verification

The authors declare that the manuscript is original, has not been published elsewhere and is not currently being considered for publication by another journal. All named authors have read and approved for submitting to International Journal of Information Management.

Credit Authorship Contribution Statement

Writing, original draft, review & editing, Supervision, Project administration, Methodology, Investigation, Conceptualization. Validation, Funding acquisition, Formal analysis, Data curation,

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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