A HIGH POWERED IMPETUS FOR SUCCESSFUL BUSINESS ENTERPRISE IN TODAY'S ERA OF GLOBAL WARMING

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ABSTRACT

In today's era of climate change: Global warming, the business are facing challenges to balance growth and environmental sustainability. This paper focuses on green energy strategies for running successful business enterprises in today's climate challenges. The transformation towards green energy ensures revamping of business. To effectively impede global warming, emissions must be controlled reducing it to half by 2030 and reach net zero by 2050. Achieving these goals would require advanced solutions such as energy management systems, renewable energy integration, and sustainable operational models. It would also need global cooperation from businesses, public sector and industries to adhere strictly to energy regulations and follow environmental guidelines. Using the trans-formative approaches, the businesses would gain a competitive edge, not only economically but also attain environmental sustainability. Taking a shift from non-renewable energy to renewable energy is the urgent need of the hour. It's an ethical responsibility of industrial and commercial entities, government bodies, utility companies and business of all sizes- small to medium sized business, must reconfigure their operations directly or indirectly to reduce green- house gas emissions.

The energy management system would play pivotal role for the businesses and industries striving to operate efficiently in an era defined by environmental consciousness and escalating energy demands. These systems are designed to collect and analyse energy usage data from various organizations, enabling a detailed comparison of the usage pattern against the already set up standards or benchmarks. These systems entitle the organizations to monitor, control, and optimize energy usage, resulting in reduced costs and environmental impact. The energy management system not only gives a short term benefit but also it would resolve the issues related to global warming in the days to come. The Energy Management System would serve as a strategic asset to integrate the

renewable energy resources, achieve the regulatory compliances and meet the sustainability goals effectively. This system not only helps the organizations to comply with the regulatory guidelines but also inspire them to adopt more sustainable practices, ensuring a greener and more energy efficient future. Leveraging data driven tools such as energy management system and embracing renewable energy sources empowers businesses to meet regulatory requirement for sustainability.

This paper explores the key components for the success of a business in this challenging era, emphasizing the integration of sustainability to ensure long term viability in a climate conscious world.

KEYWORDS: Energy Management System, energy Efficiency Management, global warming, green initiative, sustainability

1.   INTRODUCTION

As the world undergoes a significant transition in business the term like, 'renewable energy resources' have become an important aspect for environmental sustainability. The adoption of renewable energy sources is set to drive an unprecedented green energy revolution. The global leaders in the High-Level Dialogue on Energy in New York, have targeted to halve emissions by 2030, and reach net-zero by 2050. Almost $423 billion was pawned by the governments and private sectors to reduce the severe impacts of climate change.

During the Dialogue, a global road map was presented and passed conjointly for:

- Termination of energy access gap

- Shifting the energy sources which emits less carbon by quadrupling solar and wind capacity

- Muzzling coal plants by 2030 in richer countries, with others by 2040

- Enhancing energy efficiency and tripling clean energy investment to five trillion dollars per year

- Directing the fossil fuel subsidies in a right way and fixing the price of carbon

- The generation of large number of environmentally sustainable employment opportunities and empowerment of the most disadvantage members of the society.

Zero use of fossil fuel is must for attaining this monumental task. Simultaneously, our focus should shift to alternative energy resources. To attain this goal, the businesses should adhere to the environmental guidelines. The businesses must incorporate well defined technological procedures in their day to day activities so that the energy

related standards could be achieved. At the heart of this transition lies the critical role of Energy Management Systems.

An Energy Management System (EMS) is a broad-gauged framework of technologies to optimize energy consumption in a business. Its primary is to improvise energy efficiency, reduce costs, and ensure environmental sustainability. EMS is a collection of software and hardware tools that optimally utilizes the energy across all the distributed energy resources.

Objectives of the study

- To gauge the effect of global warming on business environment
- To explore ingenious practices and technologies, that enable businesses to reduce their carbon footprint while enhancing efficiency and competitiveness.
- To highlight the regulatory compliances that would help in achieving long term sustainability and success.
- To map actionable strategies for businesses to succeed in the era of global warming while balancing economic and environmental priorities.

Literature Review:

- (Joanne Tingey-Holyoak, Et al, 2024)[1], had explored how climate-related risks can be better integrated into accounting for long-lived production assets, focusing on two key questions: available modeling techniques and their practical application. The study highlights gaps in climate-related asset reporting, emphasizing the need for better models and data-sharing platforms. Further research extended sectors like manufacturing and mining are recommended to enhance climate risk accounting, benefiting policymakers, accountants, and businesses globally. But the paper lacks a clear solution to address the gap of climate risk accounting in financial reporting. Practical solutions are required for exact climate risk predictions.
- (Sanjay Kumar Roy, 2023)[2], has explained how green activities at educational institutions influence undergraduates' pro-environmental conduct.
The study highlighted valuable insights by connecting green activities in education to behavioral change, it would benefit from a broader sample that includes corporate, governmental, and non-governmental organizations
- (Kerrigan Marie Machado Unter, Et al, 2023)[3], had highlighted four response types: measurement and disclosure, mitigation (most common), adaptation, and resistance (less frequent). The framework underscores the dual impact of CC and response strategies on environmental health and financial outcomes, identifying research gaps that require further exploration.More research is needed on adaptive mitigation strategies that integrate both approaches to optimize environmental and financial outcomes. Additionally, the study misses the social aspects of climate responses, such as public awareness and community engagement, which are crucial for the success of corporate and governmental actions.
- (Kashif Abbas Etal,2022)[4], has focussed its research interest on climate change which threatens socio-agricultural, economic, and physical systems, impacting well-being, food security, and global forests. While the study highlights the broad impacts of climate change, it lacks a focus on policy interventions to mitigate these effects, which gives us a scope for future research.
- (Iuliana Florentina Gheorghe,Daniela Strat,2023)[5], stated that biomass is an inexhaustible source of energy which regenerates at a rapid rate compared to the regeneration rate of other inexhaustible resources, it is produced naturally without the need for infrastructure and equipment and it also fixes and recycle the CO_2 resulted from combustion through the process of photosynthesis and it is the most cost effective source of energy for the future having zero risk. The study overlooks the environmental costs of biomass production, including deforestation and land-use changes. It also needs to address the social impacts, such as land rights issues and the potential displacement of local communities.
- (Peterson K. Ozili, 2022)[6], had reviewed post-2000 studies on sustainable development and sustainability. The study lacks a forward-looking angle on emerging trends and challenges. It also needs a thorough evaluation of how sustainable development theories are applied in practice, especially in developing countries where sustainability challenges are more significant
- (Garima Patel,2022)[7], has highlighted the green marketing implementation into their marketing strategy and corporate social responsibility program has brought benefit, high imperative to the community, and positive value to the company's green image. The study overlooks the risk of greenwashing, where companies may overstate their environmental commitments without taking real action.
- (Mr. Manoj Prabhakar M, Mrs. Amritha Ashok, Dr. Raja Kamal)[8], has highlighted that Environment is degrading at a fast pace due to industrialisation process, rapid population growth and extraction of natural resources, which in turn has led to the promotion of green products which is nevertheless increasing the consumer sensitivity. The paper overlooks challenges like higher costs and limited availability in certain markets. Further study could highlight focus on the economic and logistical barriers to increasing green product production and consumption.

• (Umair Shahzad, Riphah,, 2015)⁹, had focussed issues of global warming which is posing a big hazard and appropriate actions should be taken to manage this serious problem. The study overlooks the political dynamics that often hinder effective climate action, particularly in countries where economic growth takes precedence over environmental concerns.

Modus Operandi of Energy Management System:

• **Tracking of collected data:** collecting of energy usage data are the baby steps in taking the control of energy usage. EMS collects raw data from multiple energy sources using sensors. Data can also be collected from variety of energy sources viz. natural gas, coal, electricity etc.

• **Investigating energy usage data:** the data collected through utility bills, energy initiatives etc. is analysed. This would ultimately help the business to understand cause and effect of the current allocation of energy resources. The complex problems can be easily resolved with the help of proper investigation of energy usage data.

• **Benchmarking:** Comparing energy consumption against industry standards to set improvement targets. This comparison would enable the businesses to detect the facilities which are not operating efficiently. The inefficient resources could be rectified and necessary changes could be adopted.

Key components of Energy Management System:

• **Data Trailing and Scrutinization:** There are detectors installed to scrutinize the usage of energy in real time across all the facilities. Some software tools that collect all the data and analyze it to provide understanding of the energy consumption pattern throughout the business.

• **Energy Assessment and Analysis**: Recognizing patterns in energy consumption, spotting inefficiencies, and pinpointing opportunities for cost savings as well as comparing the usage with industry standard or historical data, which would enable to set target for improvement.

• **Regulation and Automation systems**: Systems that automatically adjust energy usage viz. switching of lights in unused areas as well as regulating energy consumption during peak hours.

• **Efficiency Enhancement and Strategic Planning:** Upgrades like solar, wind & other renewable resources, LED lighting, etc., should be included into the system so as to ensure that energy demands are evenly distributed to avoid overloading systems.

• **Adherence to Regulatory Compliances**: Ensuring that the regulatory compliances like ISO standards are duly complied with and records of energy usage and savings are properly maintained.

• **Ongoing Enhancement and Progress:** Consistently evaluating energy performance to identify further optimization possibilities, while training employees on energy-efficient practices and motivating them to get involved.

Types of energy management system-
A. A policy-driven energy management system. - The system operates based on a set of rules which define how energy should be managed. Once rules are set, the system automatically adjusts energy-consuming processes. The primary goal of an RBEMS is to optimize energy use by reducing waste and ensuring that energy is consumed only when and where it is needed.
B. Prediction-driven Energy Management Systems- The system predicts energy usage based on data from multiple sources such as historical energy consumption trends, real-time data, weather conditions, occupancy patterns, and even external factors. These systems can forecast demand for specific time periods, such as hourly, daily, or weekly, enabling proactive energy management. Once predictions are made, the system can make real-time adjustments to energy usage. The system can also schedule energy-intensive processes for off-peak hours when energy is cheaper.
C. Energy Management System via Cloud Platform – The system allows businesses to access and manage energy usage from anywhere, at any time, using internet-enabled devices. Energy consumption data from various sources is sent to the cloud, where it is securely stored and processed. These platforms provide real-time monitoring of energy use, offering businesses the ability to track energy consumption, detect inefficiencies, and make immediate adjustments to optimize energy performance. These platforms offer automated control features, allowing businesses to set predefined rules or schedules for energy systems to optimize energy use. Alerts and notifications can be set up to notify users of unusual energy usage patterns, equipment malfunctions, or when energy consumption exceeds predefined thresholds. By analyzing data and providing insights into consumption patterns, businesses can identify opportunities to reduce energy waste, cut costs, and increase operational efficiency.
The best case study which we could quote here is of Google's Energy Management Approach- Google, a global leader in technology, has long been committed to environmental sustainability depicting clearly how businesses thrive while embracing renewable energy and energy-efficient operations. By 2017, Google powered all its global operations with renewable energy, sourcing from solar, wind, and other clean sources for its data centres and offices. It

uses advanced EMS, powered by AI which revamps data centre cooling systems and predicts energy demands, enhancing energy efficiency and lowering operational costs. These practices adapted by Google reduced its carbon footprint, with a goal of net-zero emissions in data centres.

Few remarkable topmost energy system software options useful for small and large scale business in 2024:

➢ **SAP:** this software offers different product and solutions for monitoring, analyzing and optimizing the energy use such as:

Utilities Management: This software is very useful for the businesses where the role of energy consumption prominently affects the revenues of the businesses. It provides meter to cash solution for the energy and utility companies.

Energy data management (SAP IS-U-EDM): this software provides solution for managing the energy data in utility businesses with the help of central database for energy data, users allowed to:

- Schedule and Settle energy quantities
- Use real time pricing billing
- Use intercompany data exchange to exchange data in standardize formats
- Interface with automated meter reading system
- Determine actual and forecasted energy consumption values
- Compare actual and forecasted energy consumption values

Oil and gas software: this software is contributing remarkably in oil gas companies in automating the business processes. This software also helps in boost the relationship with customer and improve the interaction. The biggest challenge in front of these business is transportation which can be resolved with this software.

➢ **Entronix EMP**: this is a powerful cloud based solution offers wide range of facilities. This software is prominently designed to optimize the energy management. It integrates the data from various sources, for e.g. consolidation of data such as utility bills, sensors, weather stations etc. into a single platform. This helps the businesses enabling comprehensive monitoring and controlling the energy usage. The use of such platforms enables the organizations to reduce energy cost, cut energy emissions and improve operational reliability.

➢ **Snapmeter:** this software is useful for tracking the energy consumption, energy analytics and mobile integration. It is useful in smaller enterprises for energy monitoring.

➢ **Accruent:** this software is worth for the organizations emphasizing on risk management and energy efficiency. Its key feature includes comprehensive dashboards, energy data consolidation and benchmarking tools.

➢ **Energy CAP:** This is an ERP based software solution very popular for tracking and analysing organization's energy consumption, carbon emission and giving extensive reporting and analysis options for decision making.

➢ **Edgecom Energy**: This is an AI-powered analytics with IoT integration and demand response management which is proved to be best for the enterprises looking for innovative and sustainable energy solutions

➢ **Events 2HVAC:** This is an impactful and pliable software which is very compatible with various system. This automated software designed to integrate the event schedules with building control system such as HVAC, lighting and security. The objective of this software is to channelize the facility management while reducing energy usage and operational costs.

Apart from the above mentioned energy management software, there are prominent software used by the businesses and its quick comparison:

Feature	Facilio	Galooli	Metasys	Energy Elephant	Brightly Energy Manager
Real-time Monitoring	Yes (with IoT integration)	Yes (IoT sensors required)	Yes (Building Automation System required)	Yes (IoT sensors required)	Yes (Building Automation System required)
Data Analysis and Reporting	Yes (Advanced analytics)	Yes (Basic analytics)	Yes (Advanced analytics)	Yes (Basic analytics)	Yes (Advanced analytics)
Energy Auditing	Yes (Automated auditing tools)	Yes (Manual auditing tools)	Yes (Automated auditing tools)	Yes (Manual auditing tools)	Yes (Automated auditing tools)

Energy Benchmarking	Yes (Industry benchmarking)	Yes (Basic benchmarking)	Yes (Industry benchmarking)	Yes (Basic benchmarking)	Yes (Industry benchmarking)
Automated Controls	Yes (Smart control algorithms)	Limited	Yes (Building Automation System required)	Limited	Yes (Smart control algorithms)
Billing and Cost Management	Yes (Customizable billing features)	Limited	Yes (Customizable billing features)	Limited	Yes (Customizable billing features)
Integration with Other Systems	Yes (Open API for integration)	Yes (Limited integrations)	Yes (Compatible with various systems)	Yes (Limited integrations)	Yes (Open API for integration)
Compliance and Regulatory Reporting	Yes (Compliance modules)	Yes (Basic compliance tools)	Yes (Compliance modules)	Yes (Basic compliance tools)	Yes (Compliance modules)
Cost	Custom pricing based on features and usage	Custom pricing based on features and usage	Custom pricing based on features and usage	Custom pricing based on features and usage	Custom pricing based on features and usage
Mobile Access	Yes	Yes	Yes	Yes	Yes
Facility Optimization	Yes (Predictive maintenance)	Limited	Yes (Optimized building operations)	Limited	Yes (Predictive maintenance)
Scalability	Highly scalable	Limited	Highly scalable	Limited	Highly scalable
Industry Focus	Commercial and Industrial	Commercial and Industrial	Commercial and Industrial	Commercial and Industrial	Commercial and Industrial
G2 Rating	4.5/5(Excellent)	3.8/5 (Good)	4.3/5 (Very Good)	3.6/5 (Good)	4.4/5 (Very Good)

(Source: https://facilio.com/blog/energy-management-software/)

A quantum Leap for today's business world by using Energy Management Software (EMS)

Sustainability and Corporate social Responsibility:

The EMS provides businesses with detailed reports of energy consumption patterns and its overall environmental impact. With stricter environmental regulations, the businesses are under immense pressure to reduce carbon emissions. EMS enables the businesses to actively track and decrease greenhouse gas emissions which in turn leads to sustainable goals. It is the need of the hour for every businesses to achieve environmental sustainability to remain competitive in the ever changing economy.

Cost reduction and operational efficiency:

The ems software allows the businesses to monitor and analyze their energy consumption in real time across its various departments. Through a detailed analysis, businesses can identify inefficiencies, area of excessive energy consumption and under performing machinery. Energy cost is one of the cost component especially in businesses viz. manufacturing, retail of data centers. The system can automate energy saving measures, resulting in consistent cost savings.

Economic impact of corporate sustainability

The investment incurred for installing the Energy Management system is considerably high. The corporate operating with its legacy infrastructure, this investment can be discouraging. However, the diminishing cost of renewable energy technologies and tax incentives are proving to become less expensive. Businesses operating in long run anticipate significant savings in energy cost because of the low investment cost of maintenance. The return on investments (ROI) for these technologies is noticed within a very short span of time which can proved as a means of saving operational cost of the businesses. Realising the effectiveness of green practices, government and financial institutions are offering green financing options to support businesses like low interest loans, grants and green bonds etc. so that more businesses adopt energy efficient technologies. By shifting to renewable energy source, businesses are reducing its financial risks causing due to rising energy costs, environmental regulations and carbon taxes.

EMS can reduce the businesses' energy cost by adapting the below mentioned practices:
➢ Enhancing operational efficiencies
➢ Discarding useless machines

Improved decision making through proper data analysis:

The EMS software collects vast amount of data on energy usage of the business. This data is further analyzed using advanced algorithms, providing businesses with actionable insights to reduce energy consumption. This system helps the businesses to move from a reactive approach to a proactive approach.

Regulatory compliance:

The EMS helps the businesses to track and monitor energy usage in compliance with the national and international environmental standards. With an aim to diminish the harmful effect of carbon footprint, the global average of which per person is now near to 4 tons, energy efficiency norms and regulations enforced by different regulatory bodies are becoming stricter day by day.

Expansion and flexibility for future growth:

As businesses grow, expands into new markets or acquire additional facilities, their energy needs become more complex. The energy management system can easily adapt to the changes in the expanding business.

Incorporation using smart technologies:

Energy management system can combine with IoT devices like meters, sensors and automated systems. These devices can send a real time data to EMS to enable continuous monitoring of energy usage. It also provides opportunities for automation thus reducing the need for manual intervention.

Carbon Management:

Businesses gain a lot from implementation of the initiatives which reduce carbon emissions. Energy Management System also helps in reducing environmental impact, adapting to the environmental regulations, meeting goals to suffice corporate social responsibility.

Automated Reporting:

It plays a major role in streamlining the process of generating energy usage reports. This saves time and reduces errors in reporting and makes- the overall process more efficient and effective. Implementing EMS would improve the Company's brand image and would portray its commitment to environmental responsibility. Research has shown that companies using EMS can reduce operational costs by up to 40% over a year.

Strengths

• EMS significantly reduces the carbon footprints and become more aligned with global sustainability goals. (e.g., net-zero emissions by 2050).

• EMS reduces financial risks. Also reduce operating costs of businesses

• Business adopting green energy strategies gains the competitive advantage. They are seen as environmentally more responsible and innovative businesses leading them to get strong brand loyalty and market share and customer preference.

• Businesses stay away from the penalties, fines and regulatory interventions by adopting green strategies in to the business.

- Business expands their collaboration opportunities

Weaknesses

- Increase in initial investment cost is usually significant
- Implementing green energy strategies requires specialized knowledge and skillful human resource which a challenging situation for companies lacking in these expertise.
- It creates disturbance in regular business operations during the transformation of business from traditional to green energy strategies
- Few geographical areas lacking in renewable energy sources hence it could hinder the operations of business.

Opportunities

The opportunities are wide for businesses adapting energy management system. Due to the government and financial institution support the financial burden has immensely reduced. The global transformation towards green energies broaden the scope of renewable energy production. New business models are also evolving due to such kind of integrations.

Threats

The administrative process is quite complex and time-consuming. Smaller Industries lack the resources to navigate these processes, resulting in missed opportunities.

As more businesses are shifting towards green energy, there is threat of diminishing the gain of competitive advantage of being the initiator. During the economic recession, companies avoid investing in new projects due to tight financial budget. The incentives for renewable energy have disparities across regions and countries, creating challenges for businesses operating internationally. This inconsistency hampers long-term planning, especially in areas with weaker regulatory frameworks.

Conclusion:

In today's challenging scenario of global warming, a high stimulus is needed for adapting sustainable practices, exploring innovations and integrating environmental responsibilities with economic performances. The enterprises which are focusing on decreasing carbon footprints, conserving energy resources is gaining competitive edge through operational efficiency and boosting the brand image as well as reputation. The businesses taking initiative in combating climate change are also contributing to creating a sustainable environment by adopting eco- friendly practices, reducing carbon emissions, and promoting renewable energy solutions that benefit both the planet and future generations. Utilizing and implementing advanced technologies through energy management software, AI-driven analytics and IoT based monitoring can help businesses to optimize the energy efficiency and decrease the carbon emission.

The businesses should also take an effort to incorporate energy system software for enhancing business operation, becoming more cost effective and reducing the carbon emission so that the stakeholder's trust can be fostered to long term loyalty and support. The future objectives of the businesses should give more emphasis on environment sustainability. Alignment of the policies and objectives for adapting sustainable practices could be the best solutions for combating global warming effect.

Businesses that are prioritizing these aspects can sustain in the face of climate change. The economic growth and environmental stewardship can go hand in hand and co-exist effectively if we shift the approach of running a business from merely considering it as a tool of profit maximization to becoming a responsible business entity for the sustenance of human life.

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