



An integrated fuzzy optimal location selection model for setting up floating solar photovoltaic plant: Implications for energy sustainability in Bangladesh

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ABSTRACT

Floating Solar Photovoltaic (FSPV) plants have emerged as a promising solution, harnessing solar energy while utilizing water bodies effectively, especially for emerging economy countries with limited land resources like Bangladesh. However, selecting an optimal location for such a solar plant requires a comprehensive evaluation of multiple criteria. This research, therefore, proposes a multi-criteria decision-making framework that integrates the Fuzzy Best Worst Method (F-BWM) and Fuzzy Combined Compromise Solution (F-CoCoSo) method to determine the optimal location for establishing a floating solar photovoltaic plant in Bangladesh. Through literature review and expert validation, ten key criteria were identified for suitable site selection for FSPV. Relative weights of the identified evaluation criteria were calculated using the F-BWM method. Following that, the F-CoCoSo approach was employed to rank the eight alternative potential sites in Bangladesh based on the F-BWM weights. The F-BWM result indicates that solar irradiance, terrain elevation, and conflicts over water access are the three most significant factors in selecting the site for FSPV installation. F-CoCoSo results identified the Kaptai Lake, located in southeastern Bangladesh, and Barapaluria Coal Mine's Lake, located in northwestern Bangladesh, as the two most preferable sites for installing FSPV plants. The research findings are expected to help academicians, policymakers, energy planners, and investors by offering a nuanced understanding of the significance of various technical, environmental, and social criteria for FSPV installation projects. Additionally, it offers a robust framework for site selection that enhances the efficiency, sustainability, and feasibility of FSPV projects in Bangladesh.

1. Introduction

The global energy market started to shrink since 2021 due to rapid economic recovery following the COVID-19 pandemic. However, the situation intensified significantly into a severe worldwide energy crisis due to the conflict between Russia and Ukraine in recent years. This polarization has put pressure on energy imports in different parts of the world, particularly in Bangladesh and other countries that are rapidly industrializing and experiencing economic growth [1]. In order to achieve the objective of the Paris Agreement, which is to keep the

increase in global temperature to 1.5 °C over pre-industrial levels by the year 2100, a comprehensive transformation in the global energy production and consumption methods is necessary [2]. For Bangladesh to align with this target, it is crucial to transition from the conventional dependence on fossil fuels to sustainable renewable energy sources. Within this context, the implementation of floating solar photovoltaic (FSPV) technology emerges as a feasible option for sustainable energy generation in Bangladesh, aligning with the Sustainable Development Goals (SDGs). In recent times, Bangladesh has been putting efforts into increasing the installed capacity in power generation, but mostly, these

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Integrated Rfid Model For Optimal Selection Of Drilling

Ok Y. Yu



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Systems Approach and Quantitative Decision Tools for Technology Selection in Environmentally Friendly Drilling Ok Y. Yu, 2010 One of the petroleum industry's goals is to reduce the environmental impact of oil and gas operations in environmentally sensitive areas. To achieve this, a number of Environmentally Friendly Drilling (EFD) technologies have been developed to varying degrees. For example, the use of an elevated platform as an alternative to the gravel pad is less intrusive and leads to a more environmentally friendly approach to drilling operations. Elevated drilling platforms will require the use of piles. Another alternative to the gravel pad is the use of composite mats. Since the demand for low impact technologies for drill site construction has rapidly increased, the parametric study for the feasibility of using pile foundations and composite mats is conducted in this research. Even though a number of EFD technologies have already been developed to varying degrees, few have been integrated into a field demonstrable drilling system, i.e., combination of technologies compatible with ecologically sensitive areas. In general, it is difficult to select the best combination of EFD technologies for a given site because there are many possible combinations and many different evaluation criteria. The proposed technology evaluation method is based on a systems analysis that can be used for integrating current and new EFD technologies into an optimal EFD system. An optimization scheme is suggested based on a combination of multi-attribute utility theory and exhaustively enumerating all possible technology combinations to provide a quantitative rationale and suggest the best set of systems according to a set of criteria with the relative importance of the different criteria defined by the decision maker. In this research, the sensitivity of the optimal solution to the weight factors and the effects of the uncertainty of input scores are also discussed using a case study. An application of the proposed approach is described by conducting a case study in Green Lake at McFaddin, TX. The main purpose of this case study is to test the proposed technology evaluation protocol in a real site and then to refine the protocol. This research describes the results of the case study, which provided a more logical and comprehensive approach that maximized the economic and environmental goals of both the landowner and the oil company leaseholder.

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Table of Contents Integrated Rfid Model For Optimal Selection Of Drilling

1. Understanding the eBook Integrated Rfid Model For Optimal Selection Of Drilling
 - The Rise of Digital Reading Integrated Rfid Model For Optimal Selection Of Drilling
 - Advantages of eBooks Over Traditional Books
2. Identifying Integrated Rfid Model For Optimal Selection Of Drilling
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Integrated Rfid Model For Optimal Selection Of Drilling
 - User-Friendly Interface
4. Exploring eBook Recommendations from Integrated Rfid Model For Optimal Selection Of Drilling
 - Personalized Recommendations
 - Integrated Rfid Model For Optimal Selection Of Drilling User Reviews and Ratings
 - Integrated Rfid Model For Optimal Selection Of Drilling and Bestseller Lists
5. Accessing Integrated Rfid Model For Optimal Selection Of Drilling Free and Paid eBooks
 - Integrated Rfid Model For Optimal Selection Of Drilling Public Domain eBooks
 - Integrated Rfid Model For Optimal Selection Of Drilling eBook Subscription Services

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- Integrated Rfid Model For Optimal Selection Of Drilling Budget-Friendly Options
- 6. Navigating Integrated Rfid Model For Optimal Selection Of Drilling eBook Formats
 - ePub, PDF, MOBI, and More
 - Integrated Rfid Model For Optimal Selection Of Drilling Compatibility with Devices
 - Integrated Rfid Model For Optimal Selection Of Drilling Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Integrated Rfid Model For Optimal Selection Of Drilling
 - Highlighting and Note-Taking Integrated Rfid Model For Optimal Selection Of Drilling
 - Interactive Elements Integrated Rfid Model For Optimal Selection Of Drilling
- 8. Staying Engaged with Integrated Rfid Model For Optimal Selection Of Drilling
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Integrated Rfid Model For Optimal Selection Of Drilling
- 9. Balancing eBooks and Physical Books Integrated Rfid Model For Optimal Selection Of Drilling
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Integrated Rfid Model For Optimal Selection Of Drilling
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Integrated Rfid Model For Optimal Selection Of Drilling
 - Setting Reading Goals Integrated Rfid Model For Optimal Selection Of Drilling
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Integrated Rfid Model For Optimal Selection Of Drilling
 - Fact-Checking eBook Content of Integrated Rfid Model For Optimal Selection Of Drilling
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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