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Estimation of Renewable Solar Energy Source Using Grey Relational Analysis Method

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Abstract

Solar energy heat and in various forms like light that reaches the earth this study shows. As this energy travels, Most of it is scattered, and is lost due to reflection and absorption by clouds. By satisfactorily harnessing solar energy Studies show that Because It is abundant in nature and free of cost It is a freely available source of energy. Second, it is a promising global energy source, because it's not over, solid and then other energy sources increase output performance. Creating sustainable energy resources One of the most urgent tasks of mankind, Because of the increasing energy demand With limited global fossil fuels is in serious conflict. Therefore, solar energy is clean, In an economical and convenient manner Effective use is a big challenge. This paper deals with multi-attribute decision making (MADM) for complications Gray uses Correlation Analysis (GRA) method. GRA method Advantages of using Includes the following: Results are based on original data, And the calculations are simple And easy to understand. In a business context helps in making management decisions. This is one of the best methods. Combined with improved gray correlation analysis using the gray model An integrated forecasting method. Integrating convolution technology, of the gray model establishing the right solution, applicability of the latter Improves greatly. Effects of time delay included in the study. Improved gray correlation analysis Consistency of the two factors is not only "in scale" but as the traditional gray correlation method does, it assumes "direction". The proposed integrated method, then the existing system Provides tremendous improvement. Objective of this thesis Finding the Solar energy and using Gray Relational Analysis (GRA) method showing GRA (Gray Relational Analysis) Method, Energy efficiency, Energy variability, Economic allocation, Investment cost, Technology maturity, CO2 emission, Ecosystem impact, Employment are Alternatives and Hydro, Wind, Wind, Biomass, the evaluation parameters reached by the handler. Energy efficiency is the first rank whereas Technology maturity is having the lowest rank. In this paper Solar Energy efficiency is the first rank whereas Technology maturity is having the lowest rank.

Introduction

Perennial to earth the main source of free energy is the sun. Currently from sunlight To generate electricity New technologies are being used. These approaches have already been proven, for conventional non-hydrogen technologies around the world as a renewable alternative are widely practiced. Non-water between countries Comparison of Renewable Energy Potentials. Theoretically, solar energy is harvested and if technologies for delivery are readily available, energy needs of the entire world have the ability to fulfill. As a promising option attracted a lot of attention. For industrial purposes to harness solar energy solar collectors, Sun trackers and through giant mirrors So far to extract solar energy several attempts have been made. Universal on horizontal surface Solar energy phenomenon direct beam and May have widespread solar power. Widespread solar energy generally pyranometer, Measured by colorimeter or actinomorphic, at the same time direct beam solar radiation is measured by pyroleometers. These measuring devices usually will be installed at selected sites in the specified area and Due to the high cost of these devices Installation on multiple platforms is not possible. In addition, these measuring devices are subject to tolerances and accuracy and Resulting in incorrect/missing records can be found in the data set. Solar energy and ambient temperature, humidity and Like sunlight ratio between weather variables Describe mathematical relationships To develop solar energy models Measured solar energy values can be used. Where solar measurement is not established Using historical metric data Direct and diffuses solar energy these models can be used to predict. an impact measurement method, This is also an important factor in a given system between all other factors Analyzes uncertainty relationships. When tests are ambiguous or When the testing process cannot be carried out properly To compensate for the shortcomings of statistical regression Gray analysis helps. Gray correlation analysis of data difference between rows is a measure of absolute value, And between rows Used to measure approximate correlation. Gray system theory, pioneered by Deng, can perform gray correlation analysis for arrays. Given reference sequence and For a given set of comparison sequences, Reference in a given set and between each element To determine the relative quality Gray correlation analysis can be used. The resulting relative standards By further analysis A better comparison can be found here. In other words, Gray relational analysis for finite sequences can be seen as a measure of similarity. In cluster analysis Gray correlation analysis method has been used successfully, robot path planning, multi-criteria decision making.

Solar energy

After the first major oil crisis In the second half of the seventies, Use of renewable energy like solar energy Experienced great inspiration. Economic problems at the time the most important factors were and When oil prices fell Interest in these types of processes has waned. Reaches the earth's surface of solar energy A small fraction is expected enough to meet global energy demand. The biggest science we face and One of the technical opportunities Solar energy can be collected, converted, stored and Develops efficient ways to use. Economic barriers Mainly related to initial setup costs. by suppliers and users Cost comparisons for solar energy technologies, Accumulated professional experience, economies of scale and along with unaccounted external costs are performed against established conventional technologies. Solar Energy Technologies Its energy conservation, Social, environmental and health benefits Even when not factored into cost calculations An "uneven playing field" is faced. Finance is another important barrier. When financial institutions evaluate solar energy technologies for their creditworthiness considered carrying unusually high risks. Because solar energy projects have a short history, Long payback period and they have small income. This means higher finance charges for solar energy projects. Photovoltaic solar energy (PV) is fast growing worldwide One of the industries, And to keep that momentum going, material use, Energy consumption to manufacture these products, Device design and when it comes to production New developments are on the rise. To improve the global efficiency of cell technologies, as well as new concepts. In the first phase of this research from the perspective of the authors consulted an understanding of photovoltaic solar energy is provided. It can be observed that the authors' definitions of photovoltaic solar energy contain common terms: "electricity", "solar radiation", "direct generation", "and conversion". Hence, as a concept of photovoltaic solar energy we can adopt the following definition: From the conversion of solar energy Electricity received directly. Solar energy is an important renewable source of energy. Many companies and countries have made efforts based on research and investment in solar energy as a major alternative to burning fossil fuels. However, sustainable biomass resources and Basic land requirements Primary bioenergy production estimated to control over the medium term, whereas for solar energy Technical energy than bio energy is many times higher and by the middle of the century. The latest market developments are established So far the energy system is why solar energy it raises the question that the future is only partially represented. From this point of view, Let us first examine the historical scenes. Compared to actual deployments, we see that solar energy has been systematically underestimated so far. A green house is commonly used in agriculture as a system, this is for better productivity. Grows plants with extreme care. Solar energy is important now used to heat greenhouses. So such a system is named solar greenhouse, Solar energy heat and The lamp is used for both. This system is night and good for keeping warm on cloudy days. This system is for heat. The need to use fossil fuels Reduces drastically. In some greenhouse structures, For better plant growth to release CO2. The whole solar energy concept Light produced by the sun and/or Harvesting and utilization of thermal energy and involved in achieving such goals Considers technologies. Passive technology involves collecting solar energy without converting it into any other form of heat or light energy. For heating houses Collection of solar energy in the form of heat, Savings and Distribution of passive solar technology represents a pattern. At present, solar energy is widely used in building industries either directly or indirectly. Communities can create enormous environmental and economic benefits by using solar energy in buildings and industries. Solar Building Industries Towards the future of solar technology An inevitable move. Also, conventional passive solar thermal systems Solar products, products and Moving towards integration of systems into buildings. Solar energy in the construction industry has been limited to a few applications for centuries. However, with the development of solar technology, SWHs, solar ventilation, Air conditioning systems and As photovoltaic power systems Widely used. In the construction industry solar energy has three distinct applications:

- Passive sunspot; A building collects and distributes solar radiation using its orientation, structure and materials.
- Active solar system; Building heat or to create coolness Uses solar heating system. In this setting Generally solar collectors, Fans, pumps, radiators, solar air conditioners and There are absorption chillers.
- Photovoltaic applications; commonly known as "Zero Emission Building", The building has electricity, heat, ventilation and To create air cooling Uses a PV power system.

GRA method

In this paper, for EDM process optimization Gray correlation Analysis and a fuzzy-based Taguchi method are also studied. In the following sections, The EDM process is described first. Gray correlation analysis and fuzzy-based Aguchi method was introduced. Then, gray correlation analysis and when using the fuzzy-based Taguchi method Test results EDM process minimum electrode wear rate, Optimizing surface roughness and maximum material removal rate. Gray Relational Grade A method of measuring approximate size in teams. Among researchers Principles of Gray Correlation Analysis have attracted considerable interest. Some other researchers of process parameters Optimization have also been studied. For example, Huang and Lin tie-ching EDM to design machining parameters Gray correlation analysis was used. Fung et al. in PC/ABS composites of yield stress and elongation for mechanical properties of injection molding process to obtain optimal parameters Gray correlation analysis was performed. Microgearin studied different polymers with different process parameters. The simulation used the Taguchi method and Gray provided relevant analysis. Lynn Taguchi Method and Gray Relational Analysis with many performance characteristics Used to improve turning functions. Chiang and Chang with several performance characteristics Wire electrical discharge of particle-reinforced material To improve the machining process Gray correlation analysis was used. Yang et al. For high-purity graphite in the final grinding process Taguchi method to optimize dry machining parameters and Gray correlation analysis was used. GRA has become MADM solves problems of performance attribute values Integrate the entire range Converts to the same value for each substitution. After the GRA process Alternatives with multiple attributes Easy to compare. Attribute values the process of combining into a single value Similar to that followed in SAW and TOPSIS. In this paper, two MADM problems are investigated. Both problems consider many properties Aims to compare multiple alternatives. The first problem is the facility system design problem and the second dispatch Rule selection problem. In the first case, for IC Packaging Company, considering the six attributes of the eighteen alternatives GRA was used to find the optimal vegetation structure. In the second case, for a hybrid running shop environment, considering the five attributes to configure forwarding rules GRA was used. Under the principle of constant comparison, we need to perform data mining to achieve the objective of gray correlation analysis. Expected for each factor Based on the principles of targeted data processing Determined by Wu. This process is Gre Relation or is called a standard process. In Gray relational analysis, to normalize raw data for analysis, the data is first pre-processed. Tosun used gray correlation analysis to optimize Feed rate, cutting speed, type of drill and such as drilling point angles Drilling process parameters. Using gray relational analysis method optimizes Material removal rate, tool wear, surface roughness and including specific shear stress Based on multi-functional properties such as cutting speed, feed rate, depth of cut and machining time turning parameters. With many performance characteristics Improve turn function Taguchi method and Grey correlation analysis were used. With multi-functional properties for a side grinding process to improve cutting parameters For a set of two-level tests Chang and Lu used a gray correlation analysis. Huang et al. Maximum material removal rate and for minimum surface roughness Optimum WEDM parameters were obtained by gray correlation analysis. Yang et al. cutting speed, feed rate and depth of cut and groove width under dry machining conditions for final grinding of high-purity graphite such as average surface roughness the effect of machining parameters was studied. An orthogonal array was used for testing and to determine the optimal machining parameter setting Gray correlation analysis method was used. On process parameters of chemical-mechanical polishing Derived from Taguchi method on process parameters of chemical-mechanical polishing Lin and Ho conducted analysis of variance (ANOVA). In gray correlation analysis on the sensitivity scale Data normalization and they also analyzed the effect of data integrity. Trong et al. Gray Correlation Analysis Multiple Power Discharge Used to improve the machining process. With many performance characteristics not all of the above methods can be used. However, shear force and surface roughness "Less-optimal" performance characteristics. Due to this, Improvement in performance characteristics another performance characteristic can lead to deterioration. Therefore, rather than improving a performance characteristic, Improving several performance characteristics Very complex. In this article, in changing actions to examine several performance characteristics Gray relational analysis is used.

TABLE 1. Solar energy

	Hydro	Wind	Wind	Biomass
Energy efficiency	0.96	0.86	0.79	0.46
Energy variability	0.53	0.54	0.86	0.53
Economic allocation	0.66	0.95	0.28	0.68
Investment cost	0.62	0.79	0.74	0.85
Technology maturity	0.67	0.66	0.78	0.95
CO2 emission	0.76	0.67	0.64	0.74
Ecosystem impact	0.34	0.63	0.73	0.54
Employment	0.71	0.71	0.43	0.68
	B	**B**	**NB**	**NB**

Table 1 Shows the solar energy for Grey relational analysis Hydro, Wind, Wind, Biomass and Energy efficiency, Energy variability, Economic allocation, Investment cost, Technology maturity, CO2 emission, Ecosystem impact, Employment in this Alternatives or Evaluation value.

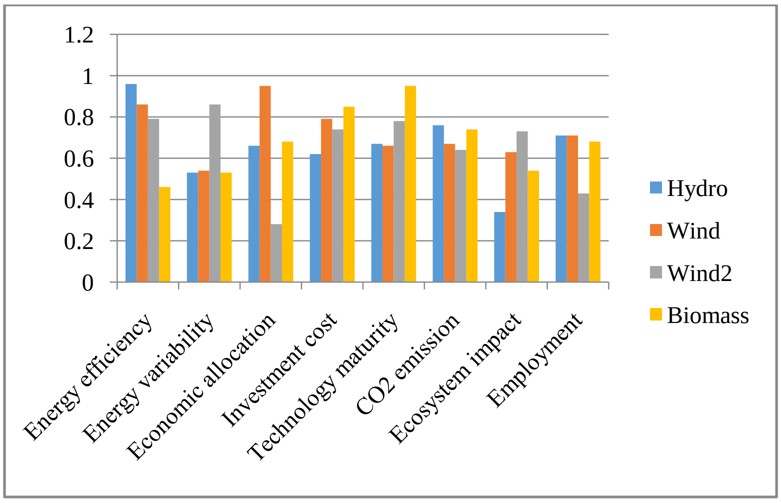

FIGURE 1. Solar Energy

Figure 1 Shows the solar energy for Grey relational analysis Hydro, Wind, Wind, Biomass and Energy efficiency, Energy variability, Economic allocation, Investment cost, Technology maturity, CO2 emission, Ecosystem impact, Employment in this Alternatives or Evaluation value.

TABLE 2. Normalized Data

	Hydro	Wind	Wind	Biomass
Energy efficiency	1.0000	0.7673	0.1328	1.0000
Energy variability	0.3103	0.0000	0.0000	0.8585
Economic allocation	0.5230	1.0000	1.0000	0.5451
Investment cost	0.4515	0.5942	0.2060	0.2043
Technology maturity	0.5375	0.2837	0.1364	0.0000
CO2 emission	0.6858	0.3266	0.3741	0.4325
Ecosystem impact	0.0000	0.2104	0.2189	0.8361
Employment	0.6029	0.4187	0.7289	0.5597

Table 2 shows the Normalized data for solar energy. Hydro, Wind, Wind, Biomass and Energy efficiency, Energy variability, Economic allocation, Investment cost, Technology maturity, CO2 emission, Ecosystem impact, Employment it is also the Normalized value.

TABLE 3. Deviation sequence

	Hydro	Wind	Wind	Biomass
Energy efficiency	0.0000	0.2327	0.8672	0.0000
Energy variability	0.6897	1.0000	1.0000	0.1415
Economic allocation	0.4770	0.0000	0.0000	0.4549
Investment cost	0.5485	0.4058	0.7940	0.7957
Technology maturity	0.4625	0.7163	0.8636	1.0000
CO2 emission	0.3142	0.6734	0.6259	0.5675
Ecosystem impact	1.0000	0.7896	0.7811	0.1639
Employment	0.3971	0.5813	0.2711	0.4403

Table 3 shows the Deviation sequence for Solar energy. Hydro, Wind, Wind, Biomass and Energy efficiency, Energy variability, Economic allocation, Investment cost, Technology maturity, CO2 emission, Ecosystem impact, Employment it is also the Maximum or Deviation sequence value.

TABLE 4. Grey relation coefficient

	Hydro	Wind	Wind	Biomass
Energy efficiency	1.0000	0.6824	0.3657	1.0000
Energy variability	0.4203	0.3333	0.3333	0.7794
Economic allocation	0.5118	1.0000	1.0000	0.5236
Investment cost	0.4769	0.5520	0.3864	0.3859
Technology maturity	0.5195	0.4111	0.3667	0.3333
CO2 emission	0.6141	0.4261	0.4441	0.4684
Ecosystem impact	0.3333	0.3877	0.3903	0.7531
Employment	0.5574	0.4624	0.6484	0.5317

Table 4 shows the Grey relation coefficient for solar energy. Hydro, Wind, Wind, Biomass and Energy efficiency, Energy variability, Economic allocation, Investment cost, Technology maturity, CO2 emission, Ecosystem impact, Employment it is also Calculated the Maximum and minimum Value.

TABLE 5. GRG and Rank

	GRG	Rank
Energy efficiency	0.7620	1
Energy variability	0.4666	5
Economic allocation	0.7588	2
Investment cost	0.4503	7
Technology maturity	0.4076	8
CO2 emission	0.4882	4
Ecosystem impact	0.4661	6
Employment	0.5500	3

Table 5 shows the Result of final GRG and Rank of GRA for Solar energy. GRG and Rank Energy efficiency 0.7620 is showing the highest value for GRG and Rank is Technology maturity 0.4076 is showing the lowest value.

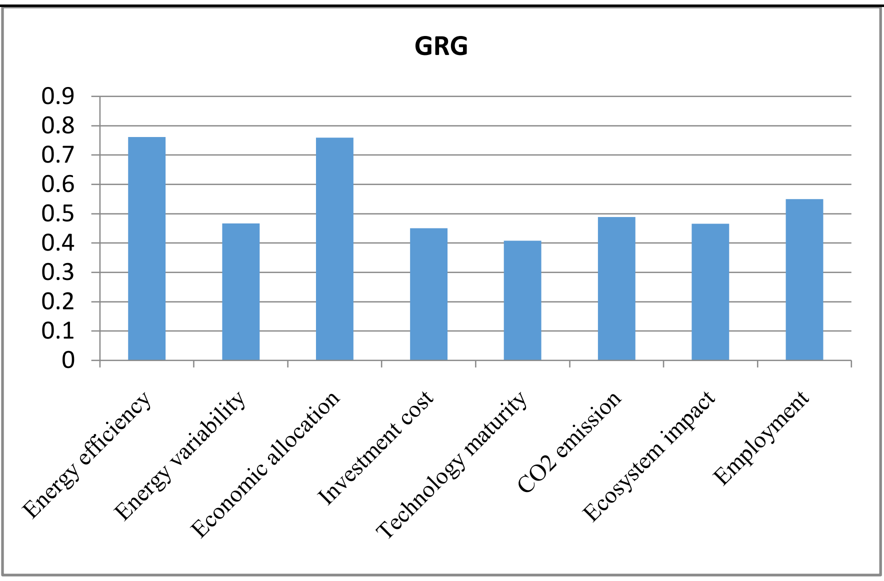

FIGURE 2. GRG

Figure 2 shows the GRG of GRA for Manufacturing Environment. Energy efficiency 0.7620 is showing the highest value for GRG Rank and Technology maturity 0.4076 is showing the lowest value.

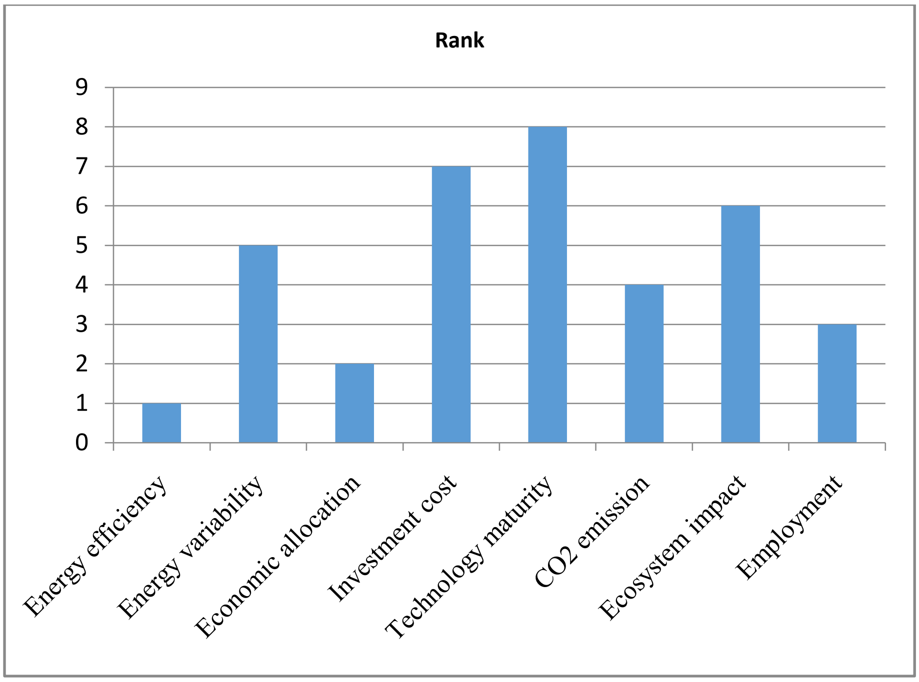

FIGURE 3. Rank

Figure 3 shows the Rank of GRAPH for Solar energy. Energy efficiency is got the first rank whereas is the Technology maturity is having the Lowest rank.

Conclusion

This progress is unlivable conditions Transforming into quality living spaces and for those who once had nothing Offers new luxuries. Ecosystem, Development communities and the solar energy market Solar PV systems can only benefit from an increase in installations. However, considering the widespread demand funding these organizations is a challenging feature. Fortunately, many companies use Solar energy By volunteering their finances, Professional and technical services It is becoming very cost effective. Both planning and operation regarding governing boundary conditions Availability of accurate information obviously depends on character. Efforts to introduce remote sensing data are promising. With many performance characteristics Improve turn functions Taguchi method and gray correlation analysis reported in this paper. Tool life obtained from Taguchi method, of shear force and surface roughness Gray relative analysis improving several performance characteristics Gray is called relative quality Converts to single performance properties. In solving MADM problems Application of GRA is feasible and we have tried to explain that strongly. In light of successful applications, GRA can be confidently used for similar applications. It is in this research area to provide some insights, then for both literature and practice to become a contribution. On the other hand, the proposed GRA From the parameter setting of the difference coefficient a rising sensibility faced the problem. The present study GRA should analyze the impact of the results. Various types of GRA method is proposed in this exam We have easy and green GRA technique Introducing GRA method, Energy efficiency, Energy variability, Economic allocation, Investment cost, Technology maturity, CO2 emission, Ecosystem impact, Employment Alternatives or Hydro, Wind, Wind, Biomass, the evaluation parameters reached by the handler. Energy efficiency is got the first rank whereas is the Technology maturity is having the Lowest rank.

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