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Evaluation of Solar Energy using Complex Proportionality Assessment (COPRAS) Method

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Abstract

Solar energy, among other renewable energy sources, In an energy crisis To manage chronic problems A promising and It is freely available source of energy. Fossil fuel, the main source of energy, is in short supply and other resources can be expensive while for energy All over the world due to high demand The solar industry is growing steadily. It also improves the economic status of developing countries and sustains the lives of many underprivileged people has become a tool to accelerate its development After long invasive research It is now cost-effective. Compared to other renewable energy sources Availability, cost-effectiveness, accessibility, capacity and Based on performance The solar industry certainly is It will be the best choice for future energy demand. such as the frequency of instrument vibrations For important multi-performance criteria To identify optimal parameters The hybrid approach is comprehensive gray complexity Considering proportionality assessment (COPRAS-G). MCDM technique was performed. ASTM A36 is used to replace mild steel Important process parameters, of the input process parameters Optimum Settings Spindle Speed: 160 r.p.m. On the applicability of COBRAS-G Aims to focus. The alternatives are Total Renewable power, Hydropower, Bio-power, Geothermal, Solar PV, Concentrating solar thermal, and Wind power capacity. The evaluation Parameter is the years 2016, 2017, 2018, 2019, 2020, and 2021. The final result of solar energy is Concentrating solar thermal is the first rank and Bio-power is the lowest rank

Key words: Neural Networks, Soft computing, Fuzzy logic and neuroscience, MCDM Method.

1. Introduction

A horizontal surface Global solar energy events direct beam and the spread may include solar energy. Widespread solar energy generally pyranometers, Solar meters, or as measured by actinography, direct beam at the same time solar irradiance is measured by a pyrheliometer. Installation on multiple platforms is not possible. Solar power and ambient temperature, humidity and Describes mathematical relationships between weather variables such as sunshine ratio to develop solar energy models. Multi-attribute decision-making (MADM) decision-makers in problems these models then use historical metrology data for locations where solar energy metering is not installed direct and transmitted. The objective of any selection process, considering all the characteristics of that option, is to identify the best option available. About various decision-making situations discusses and discusses the applications of some decision-making methods. Multi-attribute decision-making (MADM) decision-makers in problems To help them make their final decisions A multi-attribute decision analysis has been studied. For decision making in manufacturing sector a simple, complex proportionality assessment (COPRAS). The MADM methods section contains COPRAS. The COPRAS method, Based on their importance and extent of use Choose alternatives. The success of this method is its simplicity and Because of its specific interaction. However, the construct Sustainability assessment Building construction, road design etc For decision making in various fields Only a few successful applications of the COPRAS method have been reported in the literature. Most people do not consider quality criteria.

2. Solar Energy

The future world an overall basic overview of solar energy to come up with logical reasoning this paper contains trends. Photovoltaic technology, Energy status of the world, of the solar PV industry Notable Research Highlights, harnessing solar energy and also the barriers to such profession have been duly discussed. Readers of this article are from the solar industry. A clear picture can be formed and the Future world energy wise It can build its niche to be sustainable with small emissions. Solar energy can be converted into photovoltaic and photovoltaic and can be used through photo catalytic approaches. Artificial photosynthesis and photosynthetic chemical synthesis Convert solar energy into chemical energy and fuel Photovoltaic's in various fields the use of solar energy can be realized. On Advances in Solar Energy Conversion This thematic issue, Brings together experts in the field, Current research in this field, and Describes future prospects. The topic of the problem is rational design, Fabrication, and Photo

conversion Systems, Materials, Processes, and Advanced elements of technologies Focusing on characteristics. Another obvious disadvantage is that Solar energy Can only be used during the day and in hot weather Works very efficiently. Hence, solar energy is Constant weather or climatic conditions not a very reliable source of energy in areas with Also, in the installation area Air pollution levels can affect the performance of solar cells.
Currently, solar energy is either direct or widely used in construction industries indirectly. In buildings and industries Using solar energy Societies are enormous ecosystems and Lead to the creation of economic benefits. Solar building industries in the future towards solar technology are an inevitable move. Also, regular passive solar thermal systems solar products, in materials and buildings moving towards integration of systems within. In construction industries, solar energy for many centuries only had a few uses. However, with the development of solar technology, three distinct uses:

- Inactive Sunlight; Orientation of the building, structure, and using materials the building collects and distributes solar radiation.
- Active solar; to heat or cool the building uses solar heating system. Generally in this setting there are solar collectors, fans, pumps, radiators, solar air conditioners and absorption chillers.
- Photovoltaic applications; Commonly known as "Zero Emission Building" Building Electricity Charging, To create heating, ventilation and air cooling Uses a PV power system.

Using a Broad and beam Development of solar energy models can be seen. Using satellite imagery and cloud coding in fifteen Spanish landscapes ANN to predict hourly global solar radiation and Fuzzy logic is used. To predict Global solar radiation, cloud index Functional purity index Is evaluated using four alternative models, Fuzzy logic and ANN models compared to regression models It has been proven to give an accurate prediction of clarity index. Solar energy in a day and Ambiguity in sunlight period records and Fuzzy logic have also been used to predict solar energy where there is ambiguity. The fuzzy logic model, the main advantage is that In estimating solar radiation To handle uncertainties It is designed. Fuzzy sets for solar energy estimation and A detailed explanation of fuzzy logic implementation can be found here. In fuzzy logic processing, solar energy variables Sunlight and Period of solar energy is long, high, short And as small are described in terms of linguistic variables. As described in previous sections, on a horizontal surface for solar energy solar energy models, on the inclined surface Solar energy models are considered. Solar collector in a particular area of finding the optimal tilt angle on an inclined surface the objective is to model solar energy. In fact, the orientation of the solar panel and the slope is the amount of yield collected Affects severely. Hence, the maximum available in a particular area of Solar panels tilts to collect solar energy. It should also be oriented at optimal angles. The tilt of the solar panel and to improve orientation best way, active this means using the Sun Tracker. Active sun trackers or purely mechanical devices, the slope of the solar panel/solar array, and Change orientation from time to time.

3. Complex Proportionality Assessment (COPRAS)

Fuzzy COPRAS method, Geographical applicability of southern Brazil From the index diagram for alternatives to identified sites Used with commercial criteria. Cross sections are indexed by geographic relevance for established GIS-MCTM rankings when using COBRAS-F among the obtained ranks were observed Differences prove the need. To integrate geographic and business perspectives. For installation of Photovoltaic plants from a geographical point of view the best locations are obtained by GIS-MCTM They were ranked based on the geographic applicability index and from a business perspective Not the best places. MCDM Fuzzy COPRAS method In economic, social and environmental aspects Provides diversity In the case of large territorial expansions This is especially so. Nowadays, for complex real-world problems Multi-criteria decision making (MCTM) practices are gaining importance have the ability to determine distinct choices among various criteria that can be considered optimal. Mighty et al. A gray color complex proportionality assessment (COPRAS-G) was used to select different types of Cutting tool materials. Cobras-G technique was used to address subject selection issues and consider distinct subject Determining criteria and their relative importance. From the papers reviewed above, surface quality and Both power consumption It can be inferred that little attention has been paid to simultaneous optimization. The aim of the present work is to Speed to get more performance, such as depth of cut and feed characteristics optimized to ASTM A36, particularly surface roughness, Instrument vibration frequency and power consumption. Under different types of fuzzy set theory several authors have developed a conventional COPRAS approach. Keshawars Korapai et al. COPRAS and IT2FSs take an innovative approach based on tHe evaluates the supplier Select environment. Vahdani et al. For IVFSs to handle the robot selection problem Studied the COBRAS technique. Behar et al. fuzzy decision making and To obtain a total manufacturing maintenance approach A technique based on the theory of gray relations Cobras pioneered it. Wang et al. and to assess failure risk mechanisms under IVIG context Based on the proposed Analytical Network Procedure (ANP) for benchmarking Like Cobras. Zheng et al. A reluctant Fuzzy Linguistic Cobras approach was introduced to assess lung disease. Mishra et al. To describe MCDM problems with HFSs developed a COPRAS approach. Recently, Büyüközkan and Göçer, related to AHP COPRAS, presented an integrated model. Tao and Smarandache The PFCOPRAS method was calculated using the entropy method Evaluated with weights. According to existing studies, Entropy measurement for drug selection and Based on the score function No one has generalized the Cobras method in T2D disease with PFSs. A good example is the COPRAS method, It is easy to understand and Less computation is required. The COPRAS method has been richly used in many fields related to market stability, Also, seven from the Indian Institute of Technology To assess technical performance. Hence, to evaluate and rank brake friction formulas To propose a method combining/combining AHP and COPRAS This paper aims to. To evaluate and rank friction formulas This method creates friction Useful in designing with optimal tribal characteristics. Consequently, the proposed method is a useful tool for estimating brake friction formulas.

TABLE 1. Solar Energy

	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Total Renewable power	1578.00	1712.00	1849.00	1875.00	1898.00	1934.00
Hydropower	1018.00	1055.00	1064.00	1070.00	1086.00	1098.00
Bio-power	88.00	93.00	106.00	115.00	124.00	132.00
Geothermal	12.10	12.80	13.20	23.00	27.00	29.00
Solar PV	138.00	177.00	227.00	254.00	267.00	287.00
Concentrating solar thermal	3.40	4.40	4.80	5.40	5.70	6.00
Wind power capacity	319.00	370.00	433.00	474.00	489.00	510.00
	B	**B**	B	**NB**	**NB**	NB

Table 1 shows Solar Energy using the COPRAS method for Alternatives: Total Renewable power, Hydropower, Bio-power, Geothermal, Solar PV, Concentrating solar thermal, and Wind power capacity. Evaluation Preference: 2016, 2017, 2018, 2019, 2020, 2021.

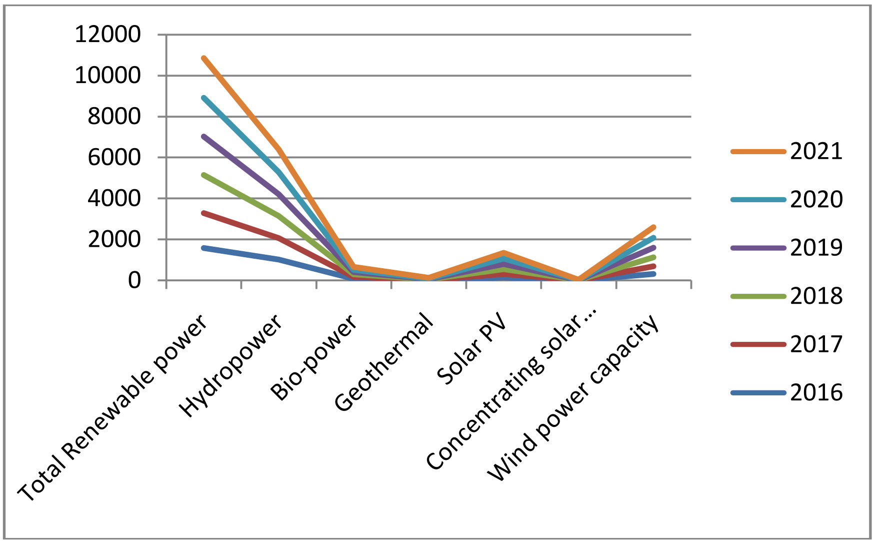

FIGURE 1. Solar Energy

Figure 1. Shows the graphical representation of solar energy Alternatives: Total Renewable power, Hydropower, Bio-power, Geothermal, Solar PV, Concentrating solar thermal, and Wind power capacity. Evaluation Preference:2016, 2017, 2018, 2019, 2020, 2021.

TABLE 2. Normalized Data

	2016	2017	2018	2019	2020	2021
Total Renewable power	0.4999	0.5000	0.5001	0.4913	0.4871	0.4840
Hydropower	0.3225	0.3081	0.2878	0.2804	0.2787	0.2748
Bio-power	0.0279	0.0272	0.0287	0.0301	0.0318	0.0330
Geothermal	0.0038	0.0037	0.0036	0.0060	0.0069	0.0073
Solar PV	0.0437	0.0517	0.0614	0.0666	0.0685	0.0718
Concentrating solar thermal	0.0011	0.0013	0.0013	0.0014	0.0015	0.0015
Wind power capacity	0.1011	0.1081	0.1171	0.1242	0.1255	0.1276

Table 2 shows the normalized data which is calculated from the data set each value is calculated by the same value in table 1. Solar energy is divided by the sum of the column of the above tabulation.

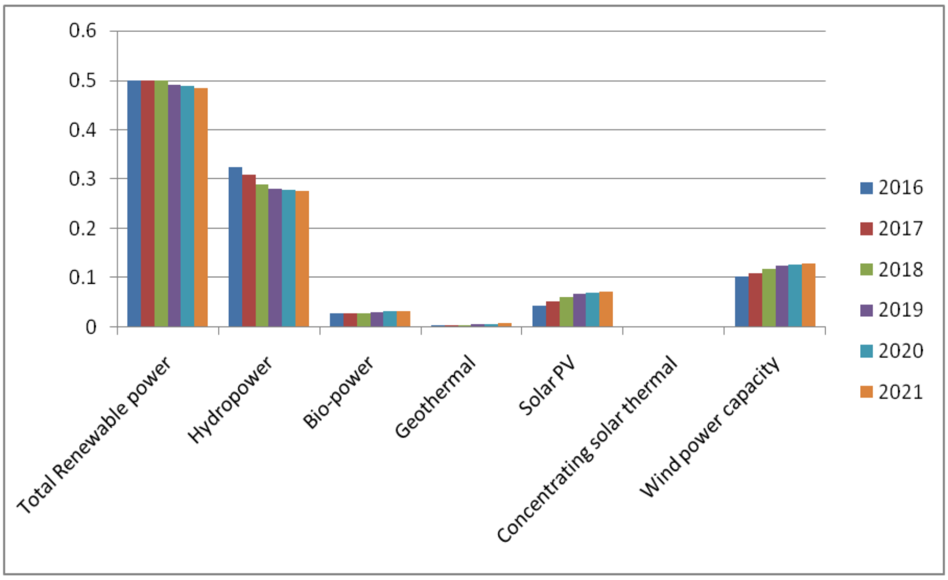

FIGURE 1. Normalized data

TABLE 3. Weight

	2016	2017	2018	2019	2020	2021
Total Renewable power	0.25	0.25	0.25	0.25	0.25	0.25
Hydropower	0.25	0.25	0.25	0.25	0.25	0.25
Bio-power	0.25	0.25	0.25	0.25	0.25	0.25
Geothermal	0.25	0.25	0.25	0.25	0.25	0.25
Solar PV	0.25	0.25	0.25	0.25	0.25	0.25
Concentrating solar thermal	0.25	0.25	0.25	0.25	0.25	0.25
Wind power capacity	0.25	0.25	0.25	0.25	0.25	0.25

Table 3 shows the weight of the weight is equal for all the values in the set of data in table 1. The weight is multiplied by the previous table to get the next value.

TABLE 4. Weighted normalized decision matrix

	2016	2017	2018	2019	2020	2021
Total Renewable power	0.12	0.12	0.13	0.12	0.12	0.12
Hydropower	0.08	0.08	0.07	0.07	0.07	0.07
Bio-power	0.01	0.01	0.01	0.01	0.01	0.01
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00
Solar PV	0.01	0.01	0.02	0.02	0.02	0.02
Concentrating solar thermal	0.00	0.00	0.00	0.00	0.00	0.00
Wind power capacity	0.03	0.03	0.03	0.03	0.03	0.03

Table 5 shows the weighted normalization decision matrix it is calculated by multiplying the weight and performance value in table 2 and table 3.

TABLE 5. Bi, Ci, Min(Ci)/Ci and Qi

	Bi	Ci	Min(Ci)/Ci	Qi
Total Renewable power	0.375	0.366	0.0030	0.377
Hydropower	0.230	0.208	0.0053	0.232
Bio-power	0.021	0.024	0.0461	0.044
Geothermal	0.003	0.005	0.2167	0.112
Solar PV	0.039	0.052	0.0212	0.050
Concentrating solar thermal	0.001	0.001	1.0000	0.503
Wind power capacity	0.082	0.094	0.0116	0.087

Table 6 shows the value of Bi, Ci, Min(Ci)/Ci, Qi The Bi is calculated from the sum of the Total Renewable power, Hydropower, Bio-power, Geothermal, Solar PV, Concentrating solar thermal and Wind power capacity. The Ci is calculated from the sum formula used.

TABLE 6. Ui and Rank

	Ui	Rank
Total Renewable power	74.8565	2
Hydropower	46.1731	3
Bio-power	8.7627	7
Geothermal	22.1800	4
Solar PV	9.9070	6
Concentrating solar thermal	100.0000	1
Wind power capacity	17.3739	5

Table 5 shows the Ui Rank value used. Ui for Total Renewable power 74.8565, Hydropower 46.1731, Bio-power -8.7627, Geothermal 22.1800, Solar PV 9.9070, concentrating solar thermal 100.0000, Wind power capacity -17. 3739. Total Renewable power is second rank, Hydropower is third rank, Bio-power is seventh rank, geothermal fourth rank, Solar PV is sixth rank, Concentrating solar thermal is first rank and Wind power capacity fifth rank.

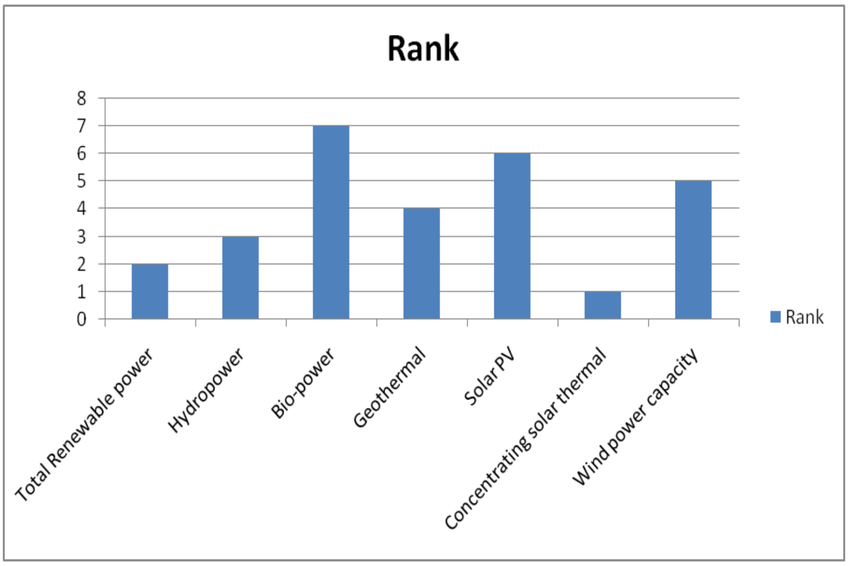

FIGURE 2. Rank

Figure 3 shows the graphical view of the final result of this paper Total Renewable power is the second rank, Hydropower is the third rank, Bio-power is the seventh rank, geothermal is the fourth rank, Solar PV is the sixth rank, Concentrating solar thermal is the first rank, and Wind power capacity fifth rank.

4. Conclusion

A hypothetical solar energy converter a description of the plant is given, It includes an algae cultivation pond, and algae digester, and together with a thermal energy generator Converts solar energy into electrical energy. Designing each unit, Description for maintenance and operation, Specifications, and cost estimates are given. Latitude and photosynthetic efficiency of the cost of line power are estimated as a function. Solar energy modeling techniques used are classified based on the nature of the modeling technique. Linear, Linear, and Artificial intelligence modeling techniques are examined in this review. According to the review, the ratio of sunlight, ambient temperature, and humidity to predetermining solar energy are correlation coefficients. Compared to linear and non-linear models ANN models predict solar energy It is also worth noting that the most accurate methods. Fuzzy Copras is used to deal with different and difficult alternatives depending the problem of subject selection is illustrated by COPRAS as a fuzzy group decision-making procedure. A firm has organized an expert panel including four decision makers to select the most suitable alternative from seven material categories for manufacturing wagon panels. The committee has decided to consider four qualitative key criteria, all of which are expressed as quantitative expressions. As a result of the ambiguous Copras method, aluminum alloys are seen as ideal materials for light rail wagons. The selected items are almost consistent from previous studies. Therefore, this method may be appropriate with the final ranking given when making strategic decisions for subject selection. The application on 'railway wagon panels and their components' is substantial because it has such a large effect on the fit of the material. The final result of solar energy is Concentrating solar thermal is the first rank and Bio-power is the lowest rank

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