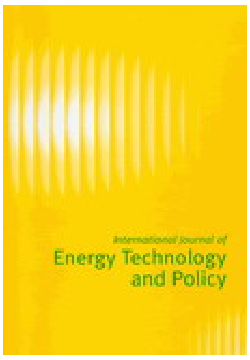

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Evaluation method for energy conservation and emission reduction potential of photovoltaic new energy based on entropy weighted matter element

Wei He*, Rujie Liu and Jicheng Zhang

Three Gorges Electric Power Co., Ltd.,
Wuhan, 430021, China
Email: he_wei2@ctg.com.cn
Email: liu_rujie@ctg.com.cn
Email: zhang_jicheng@ctg.com.cn
*Corresponding author

Lixin Wu

Institute of Electrical Engineering,
Chinese Academy of Sciences,
Beijing, 100190, China
Email: wulixin@mail.iee.ac.cn

Abstract: In order to shorten the evaluation time of energy-saving and emission reduction potential and reduce evaluation errors, a method based on entropy weighted matter element for evaluating the energy-saving and emission reduction potential of photovoltaic new energy is proposed. First, an evaluation index system is established for the potential of energy conservation and emission reduction in photovoltaic new energy. Then, by calculating the information gain rate of each indicator, measuring the importance of each indicator, and achieving quantitative processing of the indicator system, accurate evaluation results can be obtained. Finally, A matter element model is constructed for evaluating the potential for energy conservation and emission reduction of photovoltaic new energy, and the entropy weight of the evaluation indicators is calculated to complete the evaluation of energy conservation and emission reduction potential. The experimental results show that the proposed method can reduce evaluation errors and time overhead, with a maximum evaluation error of only 1.5%.

Keywords: entropy weight matter element; photovoltaic new energy; energy conservation and emission reduction; potential assessment.

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Biographical notes: Wei He graduated from the Water Conservancy and Hydropower Engineering of Wuhan University with a Bachelor's degree, and graduated from the Water Conservancy Engineering of Sichuan University with a Master's degree. He is a Senior Engineer and Intermediate Economist of Three Gorges Electric Energy Co., Ltd. His current research direction is electrochemical energy storage power station and user side power system.

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Rujie Liu received his Master's in Energy and Power Engineering from Huazhong University of Science and Technology in 2014. He is currently a Senior Engineer in Three Gorges Electric Energy Co., Ltd. His research interests include comprehensive energy, new energy, and carbon asset management.

Jicheng Zhang obtained his Master's in Power Engineering from Kunming University of Science and Technology in 2018, with a research focus on lattice Boltzmann algorithm in fluid mechanics. He currently works as a business sponsor at Three Gorges Electric Power Co., Ltd. His research interests include integrated energy, artificial intelligence, and computer vision.

Lixin Wu obtained his Master's in Power Electronics and Power Transmission from North China University of Technology in 2011, with a research focus on Power Electronics in Power System. He currently works as an Assistant Research Fellow at the Institute of Electrical Engineering Chinese Academy of Sciences. His research interests include power electronics and drivers, power quality, the flexible HVDC technology, and DC circuit breaker.

1 Introduction

With the rapid development of the global economy, people's demand for energy is also increasing. Although traditional fossil fuels have to some extent met people's needs, their non-renewable and serious pollution issues are also receiving increasing attention (Xue et al., 2022). Therefore, the development and utilisation of new energy has become a global focus of attention. Photovoltaic new energy, as a renewable, clean, noise free, and pollution-free form of energy, has enormous potential to effectively reduce greenhouse gas emissions, alleviate energy scarcity and environmental pollution issues. At the same time, photovoltaic new energy also has the characteristics of distribution and strong flexibility, which can better meet the needs of urbanisation process and energy transformation development (Zheng et al., 2022). Therefore, evaluating the energy-saving and emission reduction potential of photovoltaic new energy can provide scientific basis and reference for formulating new energy policies, promoting new energy technologies, and promoting sustainable development (Hu et al., 2021; Xie et al., 2022; Ohno, 2021). The significance of this study is to propose a scientific and reasonable evaluation method for the energy-saving and emission reduction potential of photovoltaic new energy, providing technical support and decision-making reference for promoting the development of the new energy industry and addressing environmental issues such as climate change. This method can help governments, enterprises, and other parties better understand the potential and advantages of photovoltaic new energy, formulate more scientific and reasonable development strategies and policies, and promote the realisation of sustainable development process.

Ding et al. (2023) propose a potential assessment method for energy conservation and emission reduction based on life cycle assessment. This method uses the life cycle assessment method to construct a quantitative analysis model for carbon emissions. Based on the analysis results of the model, a potential assessment index system for energy conservation and emission reduction is constructed, and the evaluation of energy conservation and emission reduction potential is completed using the analytic hierarchy process. However, there is a significant gap between the evaluation results of this method and the actual results. Gao (2022) proposed an energy conservation and emission reduction potential evaluation method based on data mining algorithm, which uses data mining algorithm to analyse the original data, uses objective weighting method to calculate the weight of evaluation indicators, uses multi-attribute evaluation method to build an evaluation model, and outputs the energy conservation and emission reduction potential evaluation results. However, the weight calculation accuracy of this method is insufficient, resulting in a decrease in the accuracy of the evaluation results. Yang (2022) propose an energy conservation and emission reduction potential evaluation method based on the entropy weighted TOPSIS model. This method first analyses the main characteristics of photovoltaic new energy generation and constructs an energy conservation and emission reduction potential evaluation index system. The entropy weighted TOPSIS method is used to construct an energy conservation and emission reduction potential evaluation model. However, the evaluation process of this method is relatively complex, resulting in a significant overall time cost.

Aiming at the problems existing in the evaluation methods of energy conservation and emission reduction potential, a method based on entropy weighted matter element for evaluating the energy conservation and emission reduction potential of photovoltaic new energy is proposed. The detailed research Technology roadmap of this method is as follows:

1 Establish an evaluation index system for the energy-saving and emission reduction potential of photovoltaic new energy based on the principles of constructing an evaluation index system.

2 After the construction of the evaluation index system for the energy-saving and emission reduction potential of photovoltaic new energy, in order to obtain accurate evaluation results, the information gain rate of each indicator is calculated based on the actual situation of different indicators, the importance of each indicator is measured, and the indicators are classified to achieve quantitative processing.

3 After completing the construction of the evaluation index system for the energy-saving and emission reduction potential of photovoltaic new energy and quantifying the indicators, the entropy weighted matter element model is used to evaluate the energy-saving and emission reduction potential of photovoltaic new energy. By determining the composite matter elements of energy conservation and emission reduction in photovoltaic systems, as well as the corresponding fuzzy membership degree of each evaluation indicator, a fuzzy matter element with optimal membership degree is constructed. On this basis, a difference square composite fuzzy matter-element is formed to construct a judgment matrix for the evaluation indicators of energy-saving and emission reduction potential of photovoltaic new energy, and it is normalised. To further improve the accuracy of energy conservation and emission reduction potential evaluation, calculate the entropy weight of each evaluation indicator, and corresponding the calculation results to the quantitative results of the indicators to complete the evaluation of energy conservation and emission reduction potential of photovoltaic new energy.

2 Construction of evaluation index system for energy conservation and emission reduction potential of photovoltaic new energy

Photovoltaic energy conservation and emission reduction refers to the use of photovoltaic technology to convert solar energy into electricity, replacing traditional fossil fuels, in order to achieve energy conservation and reduce greenhouse gas emissions such as carbon dioxide. Photovoltaic power generation systems do not require fuel and do not produce any pollutants, therefore they have excellent environmental performance. Photovoltaic new energy can be widely applied in various fields such as construction, transportation, agriculture, and industry, bringing cleaner, safer, and more reliable energy supply to people's lives and work (Tian et al., 2021; Singla et al., 2021). At the same time, photovoltaic new energy also has the characteristics of distribution and strong flexibility, which can better adapt to the needs of urbanisation process and energy transformation and development. Therefore, energy-saving and emission reduction of photovoltaic new energy has become one of the important directions for global energy transformation and sustainable development.

2.1 Principles for constructing an evaluation index system

The principles for constructing an evaluation index system for the energy-saving and emission reduction potential of photovoltaic new energy should include the following aspects:

1. Principle of scientificity: The evaluation index system should be based on reliable data and scientific methods to ensure that the evaluation results have scientific and credibility.
2. Comprehensive principle: The evaluation index system should comprehensively consider the energy-saving and emission reduction potential of photovoltaic new energy in different fields and application scenarios, and the coverage should be as wide as possible (Ma, 2023).
3. Principle of operability: The evaluation index system should have practical operability and provide clear and feasible guidance suggestions for policy formulation and practical application.
4. Comparability principle: The evaluation index system should be comparable and able to compare and evaluate the energy-saving and emission reduction potential of photovoltaic new energy in different regions, at different times, and in different application scenarios.
5. Applicability principle: The evaluation index system should be adjusted and optimised according to the differences in different regions and application scenarios, to ensure that the evaluation results are targeted and practical.

2.2 Evaluation index system

In order to accurately evaluate the energy-saving and emission reduction potential of photovoltaic new energy, and with the support of the above principles, the evaluation index system for photovoltaic new energy energy-saving and emission reduction potential is constructed, as shown in Table 1.

Table 1 Evaluation index system for energy conservation and emission reduction potential of photovoltaic new energy

Target	*Primary indicators*	*Secondary indicators*
Evaluation of energy conservation and emission reduction potential of photovoltaic new energy	Photovoltaic power generation	Photovoltaic installed capacity
		Proportion of photovoltaic power generation
		Annual growth rate of photovoltaic power generation
	Saving standard coal quantity	Saving standard coal quantity
		Energy saving ratio
		Annual growth rate of energy conservation
	Emission reduction	Carbon dioxide emissions reduction
		Proportion of carbon dioxide emissions reduction
		Annual growth rate of emission reduction
	Photovoltaic power generation per unit area	Photovoltaic power generation per unit area
		Annual growth rate of power generation per unit area
	Cost of photovoltaic new energy	Photovoltaic power generation cost
		Cost of photovoltaic modules
		Cost of photovoltaic cells
	Progress in photovoltaic new energy technology	Application of new photovoltaic technologies
		Investment in research and development of new photovoltaic technologies
		Industrialisation level of new photovoltaic technologies
	Policy support efforts	Support level of policies and regulations
		Financial subsidy policy
		Preferential tax policy
	Social awareness	Public awareness of photovoltaic new energy
		Public acceptance of photovoltaic new energy
		Promotion effect
	Proportion of renewable energy	The proportion of photovoltaic new energy in renewable energy
		Global photovoltaic new energy market share
	Environmental impact	Environmental impact assessment for the life cycle of photovoltaic new energy
		Environmental protection policy

According to the evaluation index system shown in Table 1, conduct an evaluation of the potential for energy conservation and emission reduction of photovoltaic new energy.

2.3 Quantitative processing of evaluation indicators

After the construction of the evaluation index system for the energy-saving and emission reduction potential of photovoltaic new energy, in order to obtain accurate evaluation results, the evaluation indicators are quantitatively processed. According to the actual situation of different indicators, calculate the information gain rate of each indicator, measure the importance of each indicator, and classify them into levels to achieve quantitative processing.

Set the above set of indicators $Y = \{y_1, y_2, \ldots, y_n\}$, where information gain is the difference between entropy and conditional entropy, which refers to the degree to which information uncertainty is reduced due to the introduction of certain information. The formula for calculating information gain is as follows:

$$IG(y_i, y_k) = \sum_{i=1}^{n} p(y_i) \log p(y_i) - H(y_i \mid y_k) \tag{1}$$

In the formula, $p(y_i)$ is the probability of y_i occurring, and $H(y_i \mid y_k)$ is the conditional entropy.

Table 2 Quantitative processing results of evaluation indicators

Evaluation indicators	*Classification criteria*				
Photovoltaic power generation	Low	Lower	Moderate	Higher	High
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Saving standard coal quantity	Low	Lower	Moderate	Higher	High
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Emission reduction	Low	Lower	Moderate	Higher	High
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Photovoltaic power generation per unit area	Low	Lower	Moderate	Higher	High
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Cost of photovoltaic new energy	High	Higher	Moderate	Lower	Low
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Progress in photovoltaic new energy technology	Obsolete	Backward	Moderate	Advanced	Lead
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Policy support efforts	Lack of support	Less support	General support	Strong support	Strong support
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Social awareness	Low	Lower	Moderate	Higher	High
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Proportion of renewable energy	Low	Lower	Moderate	Higher	High
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0
Environmental impact	High	Higher	Moderate	Lower	Low
	0~0.2	0.2~0.4	0.4~0.6	0.6~0.8	0.8~1.0

From this, the information gain rate can be calculated using the following formula:

$$IGR(y_i, y_k) = \frac{IG(y_i, y_k)}{\sum_{i=1}^{n} p(y_k)\log p(y_k)} \tag{2}$$

In the formula, $p(y_k)$ is the probability of y_k occurring. The higher the calculated information gain rate, the more important the indicator y_i is. Based on this, the importance of each indicator is obtained, and the evaluation indicators are divided into five levels. The corresponding quantitative values for each level are 0~0.2, 0.2~0.4, 0.4~0.6, 0.6~0.8, and 0.8~1.0, respectively. The quantitative processing results of evaluation indicators are shown in Table 2.

3 Evaluation of energy conservation and emission reduction potential of photovoltaic new energy based on entropy weighted matter element

After completing the construction of the evaluation index system for the energy-saving and emission reduction potential of photovoltaic new energy and quantifying the indicators, the entropy weighted matter element model is used to evaluate the energy-saving and emission reduction potential of photovoltaic new energy.

The entropy weight matter element model is a multi-indicator decision analysis method that can comprehensively consider the impact of multiple indicators, thus comprehensively evaluating the energy-saving and emission reduction potential of photovoltaic new energy, avoiding the limitations of single indicator evaluation, and has good interpretability, making it convenient for decision-makers to make corresponding decisions. This model mainly adopts the matter element theory and combines it with the entropy weight method to evaluate the energy conservation and emission reduction potential of photovoltaic new energy. It can handle the uncertainty and ambiguity between indicators and improve the reliability and accuracy of the evaluation results. In addition, the entropy weight matter-element model can quantify the contribution degree of each index by calculating the entropy value and weight of the index, and more objectively evaluate the energy saving and emission reduction potential of photovoltaic new energy, avoid subjectivity and Arbitrariness, improve the objectivity and scientificity of the evaluation results, and provide a more scientific and objective basis for decision-making.

The process of its implementation mainly involves determining the *n*-dimensional composite matter elements of energy conservation and emission reduction in photovoltaic systems, as well as the corresponding fuzzy quantity value membership degree of each evaluation indicator, to construct a fuzzy matter element with optimal membership degree. On this basis, a difference square composite fuzzy matter-element is formed to construct a judgment matrix for the evaluation indicators of energy-saving and emission reduction potential of photovoltaic new energy, and it is normalised. Finally, in order to further improve the accuracy of energy conservation and emission reduction potential assessment, the entropy weight of each evaluation indicator is calculated, and the calculation results are corresponding to the quantitative results of the indicators to complete the assessment of energy conservation and emission reduction potential of photovoltaic new energy. The specific implementation process is described as follows:

There are a total of n indicators $C_1, C_2, \ldots, C_n$ in the evaluation of energy-saving and emission reduction potential of photovoltaic new energy, and the corresponding fuzzy quantity of each indicator is $v_1, v_2, \ldots, v_n$. The constructed n-dimensional matter-element model is denoted as $R = (n, C, v)$. n-dimensional composite element R_{nm} for energy conservation and emission reduction in m photovoltaic systems. The expression for R_{nm} can be written as:

$$R_{mn} = \begin{bmatrix} M_1 & v & L & M_m \\ C_1 & v_{11} & L & v_{m1} \\ \vdots & \vdots & \ddots & \vdots \\ C_n & v_{1n} & L & v_{mn} \end{bmatrix} \tag{3}$$

In the formula, M_i ($i = 1, 2, \ldots, m$) represents the energy conservation and emission reduction situation of the i^{th} form, C_k ($k = 1, 2, \ldots, n$) represents the k^{th} energy conservation and emission reduction evaluation indicator, and v_{ik} represents the fuzzy quantity value corresponding to the k^{th} evaluation indicator (Zhu and Jie, 2021).

Each evaluation indicator has a corresponding fuzzy value, and the membership degree of the corresponding fuzzy value of the evaluation indicator is taken as the optimal membership degree. The membership degree indicators are as follows:

The larger the better the type:

$$\mu_{ik} = \frac{v_{ik}}{\max(v_{ik})} \tag{4}$$

Smaller, better type:

$$\mu_{ik} = \frac{\min(v_{ik})}{v_{ik}} \tag{5}$$

In the formula, μ_{ik} represents the degree of superior membership, while $\max(v_{ik})$ and $\min(v_{ik})$ represent the maximum and minimum values of the evaluation index values, respectively (Ai et al., 2023; Bermudez-Garcia et al., 2021; Liu et al., 2021).

Based on the calculation results of the optimal membership degree, construct the fuzzy matter-element of the optimal membership degree:

$$R^{\%}_{mn} = \begin{bmatrix} M_1 & \mu & L & L_m \\ C_1 & \mu_{11} & L & \mu_{m1} \\ \vdots & \vdots & \ddots & \vdots \\ C_n & \mu_{1n} & L & \mu_{mn} \end{bmatrix} \tag{6}$$

Setting the existence of standard fuzzy matter element R_{on} in the fuzzy matter element $R^{\%}_{mn}$ of the optimal membership degree, and setting Δ_{ik} to represent the square of the differences between $R^{\%}_{mn}$ and R_{on}, can form a difference square composite fuzzy matter element R_Δ. The expression for Δ_{ik} can be written as:

$$\Delta_{ik} = (\mu_{0k} - \mu_{ik})^2 \tag{7}$$

In the formula, μ_{0k} represents the fuzzy quantity value of the optimal membership degree.

R_Δ can be expressed as:

$$R_{\Delta} = \begin{bmatrix} M_1 & \Delta & L & M_m \\ C_1 & \Delta_{11} & L & \Delta_{m1} \\ \vdots & \vdots & \ddots & \vdots \\ C_n & \Delta_{1n} & L & \Delta_{mn} \end{bmatrix} \tag{8}$$

Construct a judgment matrix $A = (v_{ik})_{mn}$ for evaluating the potential for energy conservation and emission reduction of photovoltaic new energy:

$$A = \begin{bmatrix} 1 & M_1 & \cdots & M_m \\ C_1 & v_{11} & \cdots & v_{m1} \\ M & M & O & M \\ C_n & v_{1n} & L & v_{mn} \end{bmatrix} \tag{9}$$

Normalise the judgment matrix A:

$$A' = \begin{bmatrix} 1 & M_1 & \cdots & M_m \\ C_1 & a_{11} & \cdots & a_{m1} \\ M & M & O & M \\ C_n & a_{1n} & L & a_{mn} \end{bmatrix} \tag{10}$$

For indicators that prioritise the larger, there are:

$$a_{ik} = \frac{v_{\max} - v_{ik}}{v_{\max} - v_{\min}} \tag{11}$$

For indicators that prioritise the smaller, there are:

$$a_{ik} = \frac{v_{ik} - v_{\min}}{v_{\max} - v_{\min}} \tag{12}$$

In the formula, $v_{\max}$ and $v_{\min}$ represent the maximum and minimum energy conservation and emission reduction potential of the same indicator, respectively.

In order to further improve the accuracy of energy conservation and emission reduction potential assessment, entropy is defined. The entropy of the k^{th} energy conservation and emission reduction potential evaluation indicator can be expressed as:

$$H_k = -\frac{1}{\ln m} \cdot \sum_{i=1}^{m} f_{ik} \ln f_{ik} \tag{13}$$

Among them, there are:

$$f_{ik} = \frac{1 + a_{ik}}{\sum_{i=1}^{m} (1 + a_{ik})} \tag{14}$$

Calculate the entropy weight based on the entropy value of the evaluation indicators. The entropy weight of the k^{th} energy conservation and emission reduction potential assessment is:

$$w_k = \frac{1 - H_k}{n - \sum_{k-1}^{n} H_k} \tag{15}$$

In the formula, $0 < w_k < 1$.

By mapping the entropy weight results of different indicators to the quantitative results of the indicators shown in Table 2, the evaluation of the energy-saving and emission reduction potential of photovoltaic new energy can be completed.

4 Experimentation

4.1 Experimental plan and indicators

In order to fully validate the performance of the proposed evaluation method, reduce experimental errors, and improve the reliability of experimental results, the experimental plan is strictly set before the experiment. Using the evaluation error and time cost of energy conservation and emission reduction potential as indicators, the Gao (2022) method and the Yang (2022) method were used as comparative methods to conduct comparative experimental tests on each indicator with the method presented in this paper.

Evaluation error of energy-saving and emission reduction potential: The evaluation error of energy-saving and emission reduction potential refers to the difference between the evaluation results of different methods and the actual energy-saving and emission reduction potential. The smaller the evaluation error, the stronger the evaluation reliability of the method.

Time cost for evaluating energy conservation and emission reduction potential: The time cost of evaluation refers to the time it takes for the method to obtain the evaluation results of energy conservation and emission reduction potential. The lower the time cost, the faster the evaluation speed.

4.2 Experimental data

The parameter settings of the operating platform used in this experiment are shown in Table 3, where the entropy weighted matter-element model's matter-element correlation threshold is set to 0.6.

Table 3 Platform parameter settings

Parameter	*Content*
Operating system	Windows 10 64 bit
Processor	Intel Core i5-3570 K@3.00 GHz
Memory	16G
Software	MATLAB

In order to effectively validate the proposed evaluation method, it is necessary to fully select sample data. The sample data used in this experiment is from photovoltaic power generation data in a certain area, and publicly available power generation data in that area is collected for analysis of the evaluation method performance. The photovoltaic new energy power generation site is shown in Figure 1.

Figure 1 Photovoltaic new energy power generation site (see online version for colours)

The corresponding experimental environment parameters for the photovoltaic new energy generation site are set as shown in Table 4.

Table 4 Experimental environment parameter settings

Parameter	*Content*
Rated power of photovoltaic modules/W	400
open circuit voltage/V	45
short-circuit current/A	8.9
Surface temperature of photovoltaic modules/°C	25
Battery series and parallel connection mode	Series parallel hybrid
Power generation efficiency/%	20
Communication protocol	MODBUS protocol

The sample data is shown in Table 5.

Table 5 Sample data of photovoltaic new energy generation

Time	*Photovoltaic power generation (10,000 kWh)*
January	200
February	180
March	220
April	240
May	250
June	260
July	270
August	280
September	250
October	230
November	210
December	190

The sample data of photovoltaic new energy generation in Table 5 includes data from December, which can meet the needs of evaluating the energy-saving and emission reduction potential of photovoltaic new energy generation under different seasons and lighting conditions.

4.3 Analysis of experimental results

4.3.1 Evaluation error of energy-saving and emission reduction potential

The fundamental purpose of energy conservation and emission reduction potential assessment is to obtain accurate potential assessment results. Only with high accuracy in energy conservation and emission reduction potential assessment can the method have practical application value. Therefore, using the evaluation error of energy conservation and emission reduction potential as an indicator, the method proposed in this paper is compared and validated with the methods in Gao (2022) and Yang (2022). The comparison results of energy conservation and emission reduction potential evaluation errors among the three methods are shown in Table 6.

Table 6 Evaluation error of energy conservation and emission reduction potential

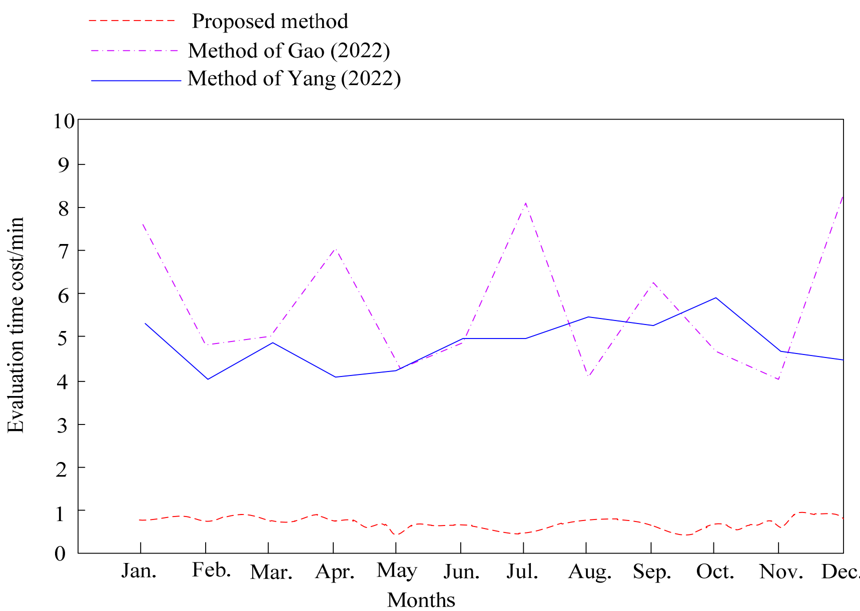
Months	*Evaluation error/%*		
	Proposed method	*Gao (2022) method*	*Yang (2022) method*
January	1.5	13.2	12.8
February	0.2	12.5	12.3
March	0.8	12.2	12.0
April	0.6	12.6	12.3
May	0.3	12.8	12.5
June	1.2	13.0	12.7
July	0.5	13.2	12.9
August	0.6	13.3	13.2
September	0.4	13.1	12.8
October	0.9	12.8	12.5
November	1.2	12.5	12.3
December	0.8	12.2	12.0

From Table 6, it can be seen that there has been a certain degree of variation in the potential evaluation error of the three methods in December. Among them, the maximum error in the energy conservation and emission reduction potential evaluation of the method in this article occurred in January, which was 1.5%. The maximum error value of the energy conservation and emission reduction potential evaluation method in Gao (2022) appeared in August, at 13.3%. The maximum error value of the energy conservation and emission reduction potential evaluation method in Yang (2022) also appeared in August, at 13.2%. Therefore, it indicates that this method can accurately evaluate the energy-saving and emission reduction potential of photovoltaic new energy.

4.3.2 *Time cost for evaluating energy conservation and emission reduction potential*

Due to the large amount and diverse types of data on energy conservation and emission reduction in photovoltaic new energy, the time cost for evaluating the potential for energy conservation and emission reduction is significant, which reduces the calculation speed of the evaluation method. In order to further validate the evaluation performance of the method proposed in this paper, the time cost of evaluating the potential for energy conservation and emission reduction was used as an indicator. Similarly, the method proposed in this paper was compared with the methods in Gao (2022) and Yang (2022), and the specific results are shown in Figure 2.

Figure 2 Evaluation of time cost results (see online version for colours)



By observing Figure 2, it can be observed that our method has significant advantages over the two existing methods in evaluating time costs. Specifically, compared to the evaluation time cost in December, the time cost of this method is much lower than that of the methods in Gao (2022) and Yang (2022). The evaluation time cost of this method is around 1 minute, with a maximum of 2 minutes. The time cost of the Gao (2022) method significantly increased, reaching a maximum of over 8 minutes. This result indicates that the method proposed in this paper can achieve good results in reducing the time cost of evaluating the potential for energy conservation and emission reduction. Compared to the methods in Gao (2022) and Yang (2022), this method can complete the evaluation task at a faster speed.

5 Conclusions

Photovoltaic new energy generation is a clean energy with zero emissions, and its reduction of greenhouse gas emissions is of great significance to the response to global climate change. In this study, an assessment method for energy conservation and emission reduction potential of photovoltaic new energy based on entropy weight matter element is proposed. First of all, under the constraints of a number of principles, the evaluation index system of photovoltaic new energy conservation and emission reduction potential is constructed. Secondly, by calculating the information gain rate of each indicator, the importance of each indicator is measured, and the quantitative processing of the indicator system is realised to obtain accurate evaluation results. Finally, a matter-element model for energy saving and emission reduction potential assessment of photovoltaic new energy is constructed, and the entropy weight of the assessment index is calculated to complete the assessment of energy saving and emission reduction potential. The experimental results show that the evaluation error of this method is only 1.5% and the evaluation time cost is no more than 2min, which can effectively reduce the evaluation error and time cost. Therefore, it shows that the evaluation method of energy saving and emission reduction potential of photovoltaic new energy based on entropy weight matter element has broad research and application prospects.

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