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Retraction

Retracted: Optimization of Zero-Energy Buildings Based on Multicriteria Optimization Method

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] J. Chen, X. Dai, and X. Cai, "Optimization of Zero-Energy Buildings Based on Multicriteria Optimization Method," *Adsorption Science & Technology*, vol. 2022, Article ID 9604936, 10 pages, 2022.

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Research Article

Optimization of Zero-Energy Buildings Based on Multicriteria Optimization Method

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This paper uses SketchUp and OpenStudio to design and optimize the multiperformance parameters of the near-zero energy consumption residential building scheme stage. By establishing a basic model, the performance parameters such as insulation thickness, typical outer window, window-to-wall ratio, and their contribution rates within the threshold range are optimized for energy conservation; simulate the energy consumption of the determined multiperformance parameter combination scheme, select the most energy-saving scheme, and calculate its energy-saving contribution rate; calculate the life cycle cost of the above schemes, select the scheme with the lowest cost, and analyze its economic benefits; select energy-saving cost and economic benefit, and calculate energy-saving contribution rate and economic benefit. Finally, through the comparative analysis of the design and test data, this paper concludes that EnergyPlus will optimize the multiperformance parameters of the near-zero energy consumption residential building scheme stage. At the same time, the multiobjective optimization method and process of the passive energy-saving technology of the near-zero energy consumption building proposed in this paper, as well as the technology combination template under different needs, provide a reference for the selection of the technology path.

1. Introduction

In recent years, the ecological environment has been seriously damaged, and various natural disasters have occurred frequently. Energy and environmental problems have become an important content that restricts China's economic development. With the continuous progress of economic and social construction, energy consumption is increasing. In addition, the energy utilization technology is backward and the efficiency is low, and the energy shortage problem appears. The energy structure dominated by coal will bring serious urban pollution, form an environmental crisis, and form a vicious circle between energy, environment, and economic development.

Professor Richard E. Smallley, Rice University [1], said, "Among the 10 major challenges facing human beings, there is no doubt that energy issues are in the first place." If there is no energy that can be used reasonably, then other problems cannot be solved. It can be seen that energy is an indispensable prerequisite for the development of human society at present [2, 3]. Such massive consumption of energy has not only led to two global energy crises. There are also a series of environmental problems such as global warming, ozone layer leakage, and smog. Therefore, actively responding to global warming, reducing carbon emissions, and slowing down the combustion of fossil energy have become a common global strategic choice. China's energy is mainly consumed in industrial production, transportation, and construction industries [4]. About 28% is in it [5]. The proportion will continue to increase. Such energy consumption for residential buildings should not be underestimated [6].

From an international perspective, building energy conservation is an important starting point for developed countries to deal with energy issues and climate change and achieve sustainable development. Domestically, promoting building energy conservation and achieving zero energy consumption in buildings are an important means of energy conservation and emission reduction, coping with climate change and improving the living environment. According to statistics, residential buildings consume 192.7 and this proportion was 17.2% in 2006, accounting for about 34.1% for industry [7]. From such perspective of home heating, it can be seen that residential buildings have become the key to energy end users, and the importance of building energy conservation is becoming more and more significant [8]. With the continuous popularization of the concept of green, circular, and low-carbon development, "consumption" will be medium and long-term goal of my country's development, because it has comfort and will be the solution to climate warming. Lack of energy, an important architectural form that responds to people's high pursuit of quality of life and high quality, has attracted more and more attention from my country's construction industry and related scientific research institutes [9]. My country has put forward the development goal of 30-30-30; that is, by 2030, 30% as well as 30% of their energy consumption should be provided by renewable energy [10]. Existing buildings should achieve "near-zero energy consumption" [11]. Under this goal, the one has officially launched the "Buildings," which is expected to be completed in 2018 and promulgated and implemented in 2019 [12]. The establishment and improvement of this technical standard urgently needs the support of a large amount of data and research results [13].

Compared with western countries, there is still a lot of room for the development of building energy conservation in China. At present, there are passive ultralow energy consumption buildings, near-zero energy consumption buildings, and zero energy consumption buildings in all climate zones in China. From the comprehensive view of the current situation in China, it is difficult to achieve the level of "zero energy consumption buildings" and the economy is relatively poor. Near-zero energy consumption building is the main direction of building energy conservation development in the future. Moving towards near-zero energy consumption building has many advantages for social development, including lower environmental impact, lower operation and maintenance costs, better power supply and natural disaster recovery capacity, and better energy security.

Based on the multiobjective optimization method, this paper divides the construction of the building, namely, planning as well as design stage or construction [14]. The planning stage is the first step for architects to make decisions, and it is also a top priority [15]. The parameters are designed at this stage [16]. Pieter, an authoritative Belgian expert, has investigated 67 buildings, and the study shows that among the 303 popular building energy-saving technologies, more than 50% need to be implemented in the design stage [17]. Therefore, energy analysis and optimization design of performance parameters in the design stage will be effective with the aim to control building consumption [18]. The energy consumption simulation is carried out for the determined multiperformance parameter combination scheme, select the most energy-saving scheme, and calculate its energy-saving contribution rate; calculate the full life cycle cost of the aforementioned schemes, select the scheme with the lowest cost, and analyze its economic benefits. The cost of energy-saving and economic benefits are selected, and the energy-saving contribution rate and economic benefits are calculated. Finally, through the comparative analysis of design and test data, the differences and reliability for such design are obtained.

Such consumption residential demonstration in a severe cold area is selected detailed energy consumption, economic calculation as well as optimization analysis is carried out for the multiperformance parameters in the planning stage, and the design value and the actual test results are compared and analyzed [19–21]. It is hoped that through the research of this paper, the reference value and combination scheme of each performance parameter design in the near-zero energy residential building scheme stage can be obtained [22–24].

2. Materials and Methods

2.1. Software Selection. The choice of software is an important way to realize the research of the thesis. The correct choice of software can not only simplify the research but also make the research results more accurate. In this paper, SketchUp, OpenStudio, and EnergyPlus centers are used in severe cold regions: first, the building physical model is established and it is then imported into EnergyPlus to simulate and optimize each performance parameter. Finally, the results of the energy simulation and the calculated LCC are analyzed to further optimize the performance parameter combination scheme. Therefore, this chapter organizes and analyzes the theoretical basis of the research content of the thesis, laying a solid foundation for the writing of subsequent chapters.

2.1.1. Introduction to EnergyPlus. EnergyPlus is the United States Renewable Energy Laboratory (American Renewable Energy Laboratory), Lawrence National Laboratory (Lawrence, Berkeley). It has consumption simulation and load calculation software jointly developed by BLAST and DOE-2, so many simulation features of EnergyPlus have inherited the programs of BLAST and DOE-2. Free and open-source features help it to be widely used around the world. EnergyPlus can calculate the cooling and heating load of the building according to the physical composition and mechanical system of the building (HVAC system), which maintains the indoor set temperature through the HVAC system. EnergyPlus can also output very detailed data, such as solar radiation heat gain through windows, to verify with real data.

EnergyPlus is a software for cooling and heating load simulation and energy analysis. Based on the user's description from the physical model of the simulated object, the HVAC system, the control system, etc., EnergyPlus calculates the energy consumption as the amount of cooling necessary to maintain the temperature control setpoint, taking into account all HVAC systems. Heat loads, equipment loads, and many other simulations are performed with the aim to match what would be expected in the actual building.

EnergyPlus can be here. There are mainly the following calculation modules. It is shown in Figure 1.

2.1.2. Introduction to OpenStudio. EnergyPlus is an input and output method using ASCII text format, which has extremely high professional requirements for simulation

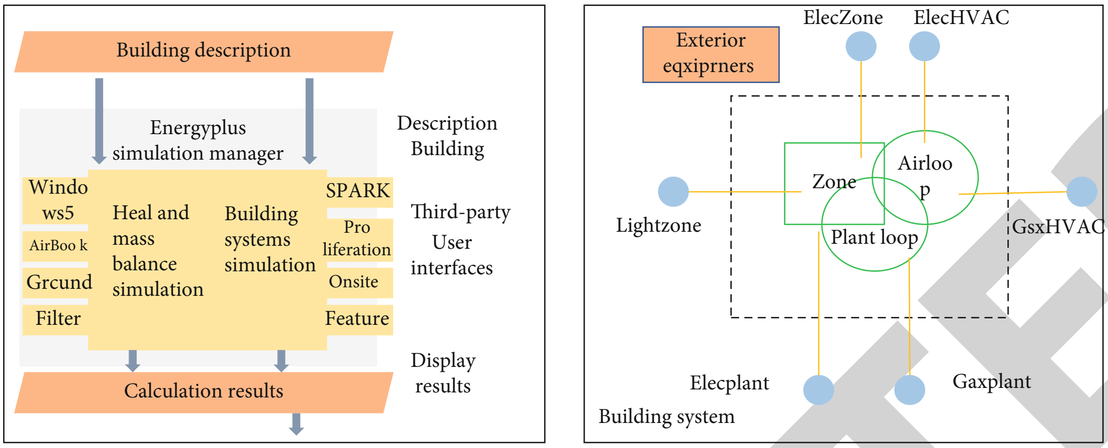

FIGURE 1: Schematic diagram of EnergyPlus module integration.

personnel. This article uses OpenStudio; the following is an introduction to the plugin.

OpenStudio uses EnergyPlus program to simulate the energy consumption of buildings, but unlike EnergyPlus, OpenStudio's settings are visual modules, not just data modules, so OpenStudio can also be regarded as a visual user interface of EnergyPlus. In addition, OpenStudio can not only carry out energy simulation analysis but also can carry out lighting simulation analysis. OpenStudio can use SketchUp to build the 3D geometric model of the simulated object, so it can be seen that OpenStudio is very suitable for architects. Similar to EnergyPlus, OpenStudio is also an open-source free software for the convenience of users.

The user interface part of OpenStudio consists of four modules: main interface, the OpenStudio SketchUp Plugin, OpenStudio Application, and the Parametric Analysis Tool. OpenStudio SketchUp Plugin is a plugin of the three-dimensional modelling software SketchUp, used to establish a three-dimensional geometric model of energy simulation buildings. The output format is the same idf format as the EnergyPlus file. OpenStudio Application is used to input the results of energy consumption simulations for visual viewing, especially for viewing parameters that change with time, such as room temperature changes. The Parametric Analysis Tool is used for the parameterized analysis of the benchmark model (due to the complex operation and imperfect development, this tool is not used in this study).

2.2. Theoretical Basis for Multiperformance Parameter Design Optimization of Zero-Energy Residential Buildings. *The Technical Standard for Near-Zero Energy Consumption Buildings* defines zero energy building as a building that adapts to climate characteristics and natural conditions, reduces the heating and cooling demand of buildings to the maximum extent, improves the efficiency of energy equipment and systems to the maximum extent through passive technical means, makes full use of the building itself and the surrounding or purchased renewable energy, and makes the annual energy supply of renewable energy greater than or equal to the total energy consumption of the building.

Generally, high-performance thermal insulation materials and door and window components are used for the envelope structure to improve the thermal insulation performance. Although they help to reduce energy consumption, they will also increase the initial cost of the building and lead to an increase in the total cost. It is necessary to fully consider various technical parameters in the building design. If the thermal insulation thickness is too small, it will increase it and increase the energy consumption. However, the thermal insulation thickness is not as large as possible. Excessive thermal insulation thickness will lead to an increase in the cost, and the thermal insulation effect will not necessarily be greatly improved. Therefore, it is necessary to the design of the thermal insulation thickness of the envelope structure is studied.

In the research field of determining principles and optimization methods of architectural design parameters, scholars at home and abroad have made some explorations. The research shows that the multiobjective optimization method has important reference significance for architectural designers to make decisions on architectural design parameters. Taking a hospital as a research case, Ascione (2016) set primary energy consumption, initial investment of transformation scheme, and total cost as optimization objectives and combined MATLAB with EnergyPlus to provide design reference for the construction scheme of the hospital building through optimization analysis.

At present, domestic thermal insulation materials and structural types are mainly divided into single material one. Among such above three types of single insulation layers, the external insulation has a good energy-saving effect. Graphite polystyrene board (EPS) and extruded polystyrene board (XPS) are currently the most widely used thermal insulation materials in China. However, there is almost no research on the influence and design optimization of EPS external insulation exterior wall and XPS external insulation roof and ground in China. Graphite polystyrene will be currently and most widely used thermal insulation material among all thermal insulation materials. It has the largest market share in Europe and China. A Neopor factor contained in it has the function of heat reflection, and the fire resistance is B1 level of flame retardant. At present, this thermal insulation material has been included in the national building material standard and is also the preferred thermal insulation material for passive houses. Extruded polystyrene board is a kind of polystyrene board whose production process is extrusion molding. It also integrates waterproof and thermal insulation functions. It has high rigidity, good compressive performance, and low thermal conductivity, but it has poor vapor permeability and dimensional stability. It is used for quality accidents such as system shedding and veneer cracking in external wall insulation.

Guided by energy consumption index and comfort, the scheme starts from the level of design scheme, comprehensively considers various factors, improves building thermal insulation performance, reduces building energy consumption and creates a comfortable indoor environment through planning and layout, passive technology, high-performance energy system, and other measures, and reasonably utilizes renewable energy in combination with building shape and site to achieve the goal of near-zero energy consumption (Figure 2).

When comparing different engineering design schemes, it is usually necessary to consider multiple objectives, and there will be conflicts between different objectives. The multiobjective optimization can solve the complex problems of multiple influencing factors by establishing mathematical models and setting corresponding constraints and finally optimize the scheme according to the objectives that need to be selected. There is a competitive relationship between the multiple goals set, such as energy conservation and economy: when the building achieves the goal of low energy consumption through various technologies, the incremental cost of the project may be very large and the economy is poor.

3. Results and Discussion

3.1. Basic Equations for Energy Simulation. Since EnergyPlus is an integrated synchronous solution of the Building Module, Air Module, and HVAC System Module, it is a synchronous simulation software. In order to obtain more realistic simulation results, EnergyPlus introduced the regional air heat capacity method in the heat balance calculation. The zone air heat capacity method refers to the zone temperature at the last time step to predict the system response and changes the time step. EnergyPlus calculates building energy consumption according to the first law of thermodynamics and calculates the instantaneous load of the room through the law of energy conservation.

$$q_i(t) = h_i(T_R(t) - T_i(t)) + \sum_{k=1}^{n}(T_R(t) - T_i(t)) + R_i, \quad (1)$$

$$Q(t) = \sum_{k=1}^{n} S_i h_i(T_i(t) - T_R(t)) + m(t)c_p(T_o(t) - T_R(t)) + Q_s(t), \quad (2)$$

where $q_i(t)$ is the heat gain of the ith surface at time t (kW/m^2), h_t is the heat transfer coefficient of the ith surface (kW/m^2-K),; $T_R(t)$ is the indoor calculated temperature (K), $U(t)$ is the ith inner surface temperature (K), R_i is the radiation absorption of the ith surface (kW/m^2), $Q(t)$ is the cooling load at time t (kW), S_t is the area of the ith surface (m^2), $m(t)$ is the fresh air volume at time t (kW/s), $T_0(t)$ is the calculated temperature of outdoor air (K), and $Q_s(t)$ is the calorific value (kW) of the indoor heat source at time t.

The expression of the time constant T of the dynamic process of regional air state changes is shown in

$$\tau \approx \frac{\rho V c_p}{\left|Q_{\text{load}} + Q_{\text{sys}}\right|}. \quad (3)$$

It can be seen from equation (3) that the value of the time constant T also changes, and the regional heat capacity also changes. Therefore, in order to ensure the stability of the software simulation process, a regional temperature equation is established.

$$C_z \frac{dT_z}{dt} = \sum_{i=1}^{N_{sl}} Q_i + \sum_{i=1}^{N_{\text{surfaces}}} h_i A_i (T_{si} - T_z). \quad (4)$$

Since the total energy stored in the regional air is very small, equation (4) can be simplified to

$$-Q_{\text{sys}} = \sum_{i=1}^{N_{sl}} Q_i + \sum_{i=1}^{N_{\text{surfaces}}} h_i A_i (T_{si} - T_z). \quad (5)$$

The output heat of the system can also be described by the regional output air enthalpy formula:

$$-Q_{s^{ss}} = m_{\text{sys}} C_p \left(T_{\text{sup}} - T_z\right). \quad (6)$$

Substituting equation (4) into equation (6) can obtain equation (7), which means that the energy stored in the regional air = the sum of the regional load and the system output energy:

$$C_z \frac{dT_z}{dt} = \sum_{i=1}^{N_{sl}} Q_i + \sum_{i=1}^{N_{\text{surfaces}}} h_i A_i. \quad (7)$$

For further analytical equations, Euler's equation (8) is introduced:

$$\frac{dT}{dt} = (\delta t)^{-1}\left(T_z^t - T_z^{t-\delta t}\right). \quad (8)$$

Substitute Euler's equation (8) into equation (7) to get the following equation:

$$c_z \frac{T_z^t - T_z^{t-\delta t}}{dt} + T_z^t \left(\sum_{i=1}^{N_{\text{surfaces}}} h_i A_i + \sum_{i=1}^{N_{\text{zones}}} m_i C_p + m_{\text{inf}} C_p + m_{\text{sys}} C_p\right). \quad (9)$$

In order to make the calculation result more accurate and stable, r is expressed by a higher-order differential

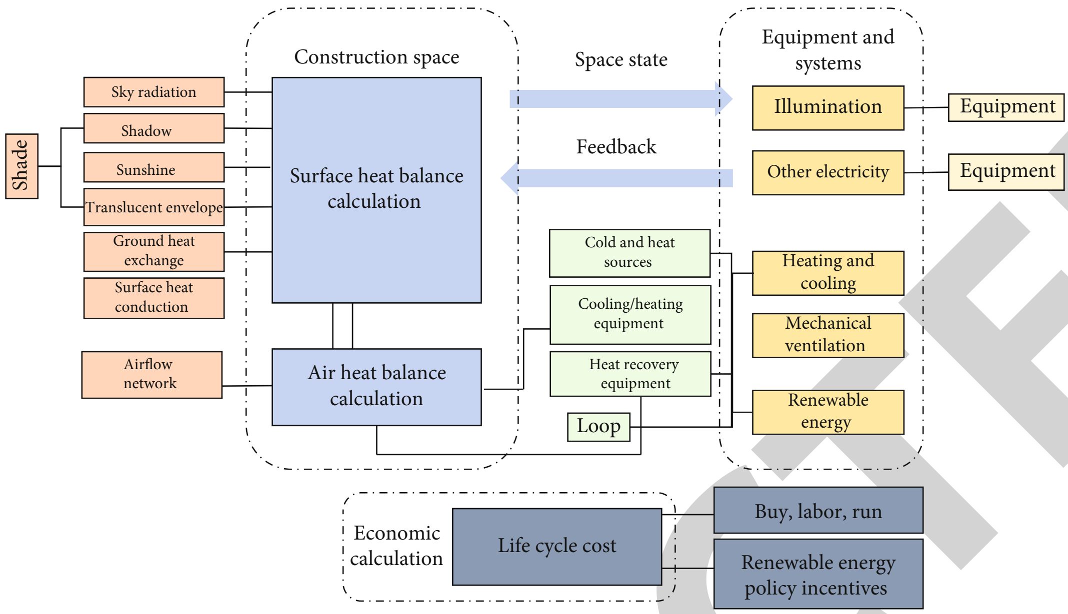

FIGURE 2: Architecture of zero-energy building performance simulation computing module.

expression (equation (11)):

$$\left.\frac{dT_z}{dt}\right|_t \approx \delta t^{-1}\left(\frac{11}{6}T_z^t - 3T_z^{t-\delta t} + \frac{3}{2}T_z^{t-2\delta t} - \frac{1}{3}T_z^{t-3\delta t}\right) + o\left(\delta t^3\right). \tag{10}$$

The equation used by EnergyPlus is shown in formula (10). The starting point of the whole simulation process of the software is the load simulation. The load simulation provides the parameters required for the system simulation and then makes necessary adjustments to the temperature, thereby completing building consumption. Simulate this complete process.

3.2. Simulation Study on the Influence of Each Facing Window-to-Wall Ratio on Energy Consumption. Before doing the energy-saving optimization of severe cold areas, the requirements of the lighting standards for the one should be considered. In this paper, the standard of the average day lighting coefficient of the lighting area is not less than 1% to calculate the minimum window size, and the window size

$$C_b = \frac{W(S+5)f}{100A_{\mathbf{b}}T}(1-T). \tag{11}$$

In the formula 11, C_b is the daylighting coefficient; W is the area of the window hole;.Then, the area of the window is calculated by the following formula:

$$W = \frac{100A_bTC_b}{(S+5)f(1-T)}. \tag{12}$$

In the calculation, S takes the value according to formula 11, and then, when it is completely cloudy and the outdoor is not blocked, $S = 39$; r is taken as 0.7, 0.5, and 0.3; this calculation $r = 0.5$.

The window size can be calculated by formula (12), and then, the minimum required for study can be calculated from the definition of the window-to-wall ratio, that is, the percentage of the area of the external window opening in the building facade to the area of the unit on which it is located. After calculation, the minimum window-to-wall ratios for cold areas to meet the lighting conditions are 10.66% in the north direction. The energy consumption simulation is carried out for the determined multiperformance parameter combination scheme, select the most energy-saving scheme, and calculate its energy-saving contribution rate; calculate the full life cycle cost of the aforementioned schemes, select the scheme with the lowest cost, and analyze its economic benefits. The cost of energy-saving and economic benefits are selected, and the energy-saving contribution rate and economic benefits are calculated. Finally, through the comparative analysis of design and test data, the differences and reliability for such design are obtained.

This calculation result is used as the constraint basis for the energy-saving design optimization of each facing window and wall ratio so that the optimization result is more accurate and meets the needs of people's daily life.

For effect obtained when the optimization of performance parameters in the comparison scheme stage is applied to the saving contribution rate is calculated according to

$$f = \frac{E_0 - E}{E_0}. \tag{13}$$

The probes of the two temperature autographs are, respectively, attached to measured wall, located in the middle of the wall, to measure the inner and outer surface

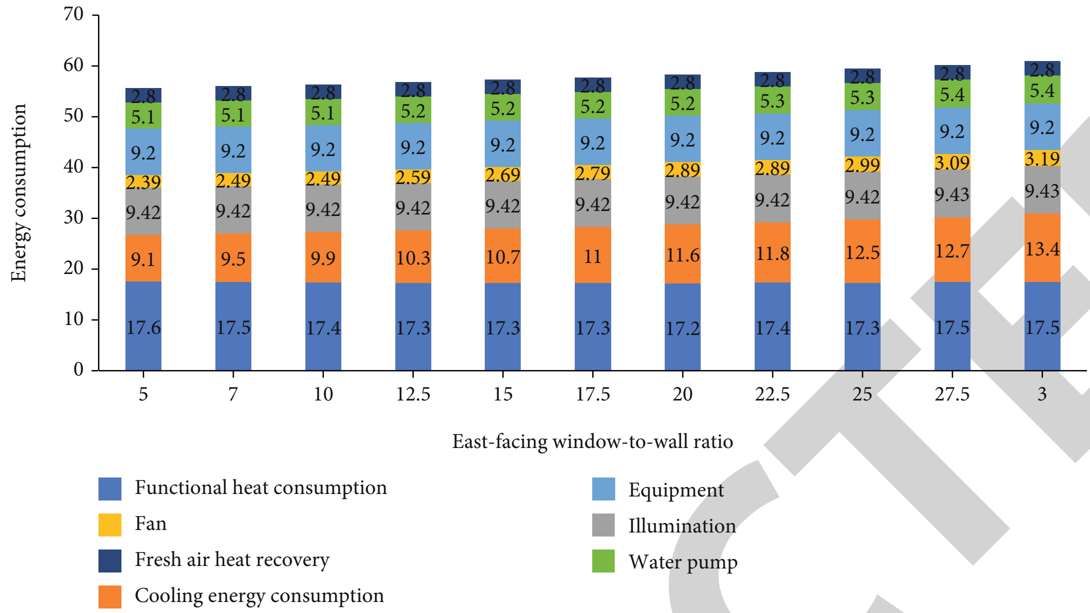

Figure 3: The simulated energy consumption distribution of the east-facing window-to-wall ratio with a heat transfer coefficient of 1.0 W/(m^2K).

temperatures of the wall at the set interval time, respectively; the heat flow meter is closely attached connected to the inspection instrument at a position parallel and adjacent to the inner wall and the probe of the temperature recorder, and measure the heat flow value passing through the wall at the set interval.

$$\Phi = \frac{\lambda A \Delta t}{\delta}, \tag{14}$$

$$\mathbf{q} = \frac{\Delta t}{R}. \tag{15}$$

4. Experimental Results and Analysis

4.1. Energy Consumption Simulation and Optimization Selection of Each Combination Scheme. There is such distribution of typical east (west) exterior windows and window-to-wall ratios, respectively. It can be seen from the figure that no matter which exterior window is used, the change in energy consumption for cooling is greater than that for heating. For external 1.0 W/(m^2K), it is 22.5%; the heating energy consumption exceeds the 19.6 GJ specified in the technical guidelines; for a heat transfer coefficient of 1.1 W/(m2K), such heating energy consumption also exceeds 19.6 GJ, and when the window-to-wall ratio is 30%, the total energy consumption is 66.04 GJ, which exceeds the regulations in the guideline 65.3 GJ, which is not desirable, and the rest are in line with technical standards. In order to further study the window-to-wall ratio of typical east (west) exterior windows, the heating, cooling, and total energy consumption was integrated into a graph, which is in Figure 3.

It can be seen from Figure 3 that when the window-to-wall ratio is less than 15%, the heating energy consumption basically does not change, and the total energy consumption is relatively flat. The thermal coefficient is 0.9 W/(m^2K), and the window-to-wall ratio is 11.59%-15%. This also indirectly verifies the relevant conclusions.

It can be seen from Figure 4 that with the increase of the heat transfer coefficient of these types of windows, the curve becomes steeper and steeper, that is, the trend of heating energy consumption increases with the east (west) window-to-wall ratio. The curves of cooling energy consumption almost overlap, and the heat transfer coefficient has a clear gap from 0.9 W/(m^2K) to 1.0 W/(m^2K), while the heat transfer coefficient is 1.0 W/(m^2K). The change trend of cooling energy consumption is the same as that of 1.1 W/(m^2K); there is a small interval but not as obvious as the heat transfer coefficient from 0.9 W/(m^2K) to 1.0 W/(m^2K).

4.2. Energy Consumption Simulation and Optimization Selection of Multiperformance Parameter Combination Scheme. Combination of different performance parameters, a total of 81 energy consumption simulation schemes, input variables one by one in EnergyPlus to simulate energy consumption. The 73rd scheme A3B3C1D1 has the lowest total energy consumption; that is, the external wall insulation thickness is 320 mm, the roof insulation thickness is 300 mm, the heat transfer coefficient is 0.8 W/(m^2K), the window-to-wall ratio is 12.5%, and the total energy consumption is 53.65 GJ. The ninth scheme A1B1C3D3 has the highest energy consumption; that is, the external wall insulation thickness is 280 mm, the roof insulation thickness is 260 mm, the heat transfer coefficient is 1.0 W/(m^2K), and the window-to-wall ratio is 17.5%. The energy consumption is 61.50 GJ, and the change diagram of heating, cooling, and total energy consumption is shown in Figure 5. It can be seen from the figure that the combination of heating, cooling, and total energy consumption is periodic, and the total

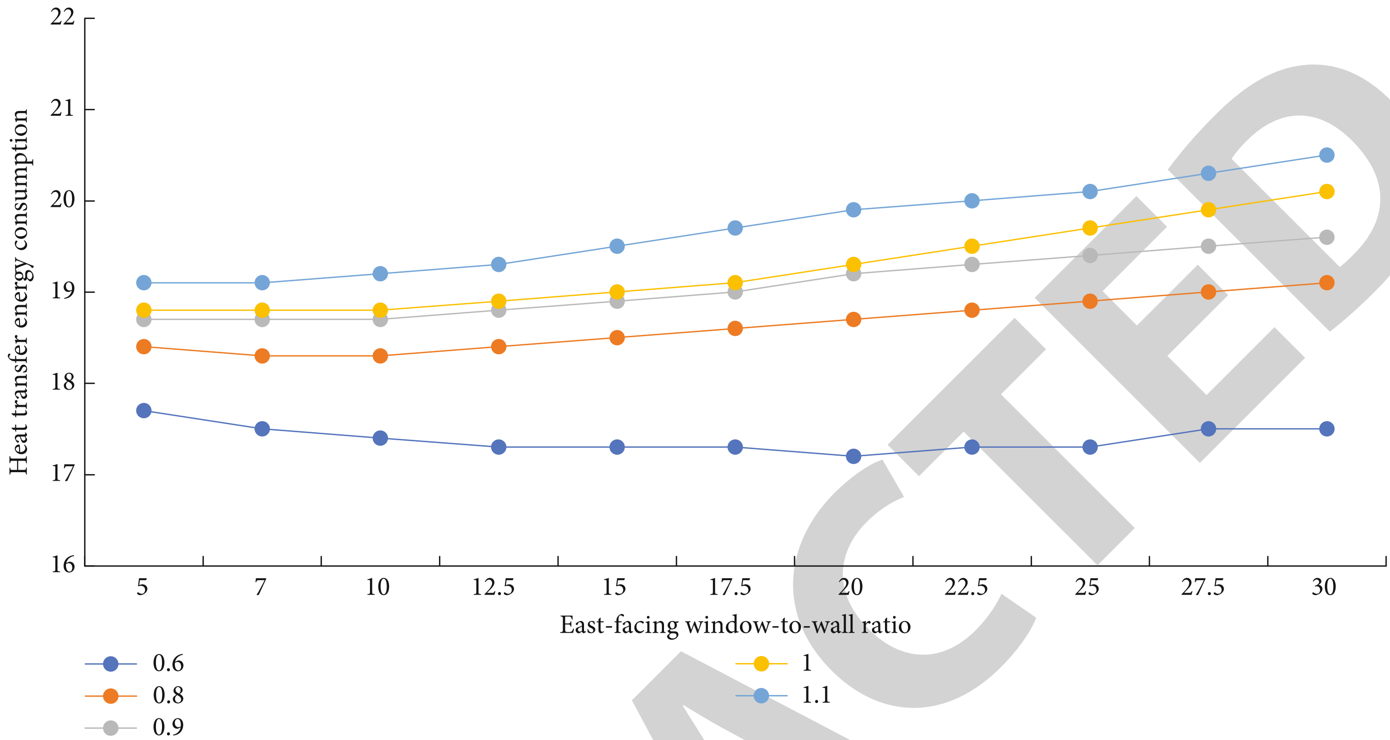

Figure 4: Variation of heating energy consumption of typical exterior windows with east-facing window-to-wall ratio.

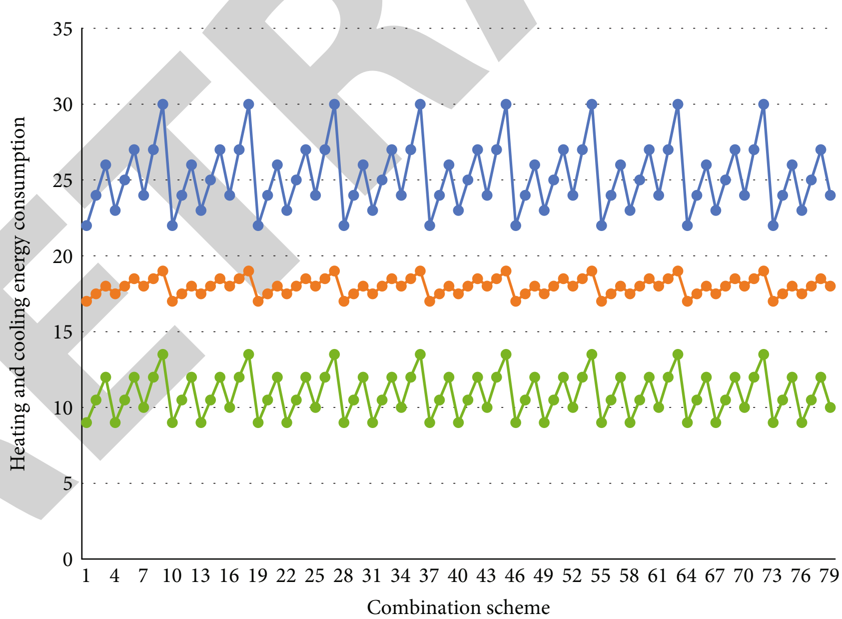

Figure 5: Changes in heating, cooling, and total energy consumption of the combined scheme.

energy consumption is cyclical. The energy consumption fluctuates the most, followed by the cooling energy consumption, and finally the heating energy consumption. The total energy consumption and heating energy consumption of the No. 73 scheme are the lowest, and the cooling energy consumption of the No. 1 scheme is the lowest, but it is different from the cooling energy consumption of No. 73, 0.1 GJ, so the most energy-efficient solution is No. 73.

Figure 6 will note that when the thermal insulation increases continuously, the heating and total energy consumption decreases, and the change trend is similar and tends to be gentle, while the cooling energy consumption increases but does not change significantly, it can be seen

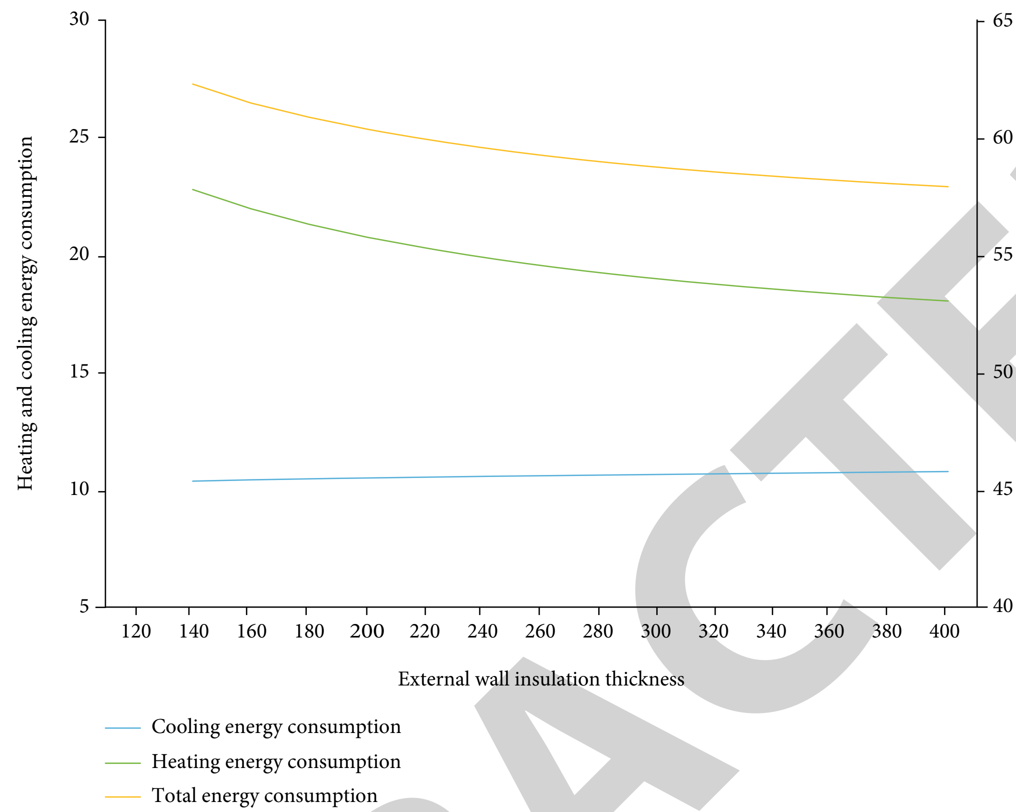

Figure 6: Variation of heating, cooling, and total energy consumption with the thickness of external wall insulation.

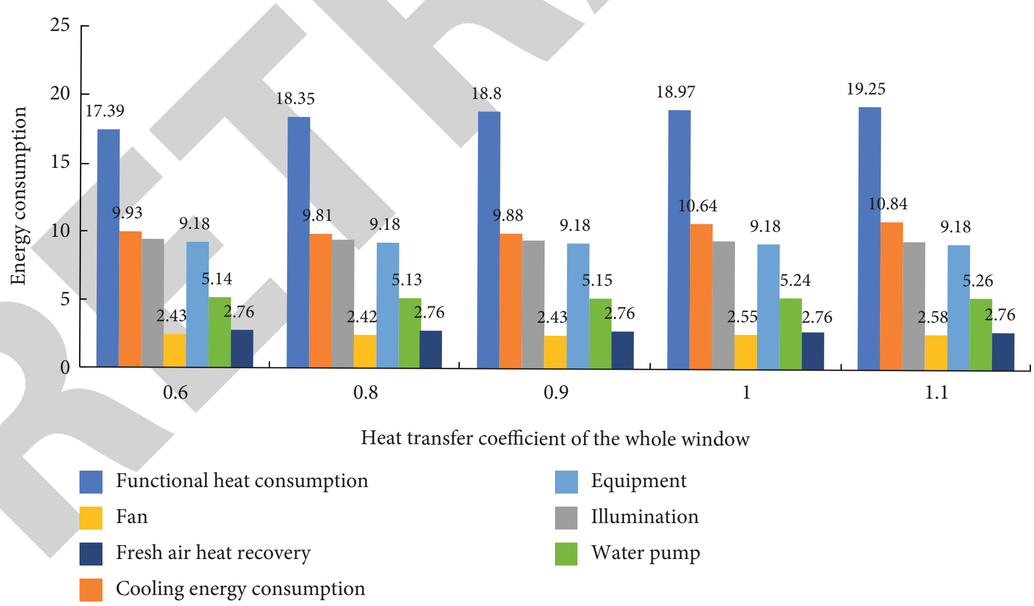

Figure 7: Distribution of energy consumption simulation results for five types of windows.

that the thermal insulation thickness of the external wall decreases. The effect on heating in winter is greater than cooling in summer. As it is 260 mm, the heating energy consumption exceeds the standard by more than 19.6 GJ. As we all know, the cost of the exterior wall is proportional to the insulation thickness. When the insulation thickness is greater than 320 mm, it basically does not change, but the cost increases proportionally.

Input the thermal parameters of the five types of external windows into EnergyPlus, and conduct energy consumption simulation. The energy consumption distribution of the simulation results is shown in Figure 7. The abscissa is arranged according to the five types of windows. For several kinds of exterior windows, the heating simulation results are dominant, followed by the cooling energy consumption. The heating, cooling, and total energy consumption is separately proposed for analysis. As shown in Figure 7, it is an order of magnitude, which is set on the main ordinate axis, and the total one is set separately. On the secondary vertical axis, the vertical axis interval is 5 GJ to facilitate comparison.

5. Conclusion

First, according to the energy consumption simulation results of each performance parameter, this paper summarizes the influence of near-zero energy consumption in cold regions, studies the optimized parameter values, and calculates the corresponding energy-saving contribution rate; for the combination scheme of multiple performance parameters, the most energy-saving scheme will be calculated; for the above-mentioned combination schemes, study the optimal economic benefit scheme, calculate the corresponding energy-saving contribution rate, and analyze its economic benefits; the cycle cost is calculated, the dual optimization scheme of energy-saving effect and economic benefit is studied, and the economic benefit of the optimization scheme is analyzed. Then, this paper simulates the energy consumption of the determined multiperformance parameter combination scheme, selects the most energy-saving scheme, and calculates its energy-saving contribution rate; calculate the life cycle cost of the above schemes, select the scheme with the lowest cost, and analyze its economic benefits; select energy-saving cost and economic benefit, and calculate energy-saving contribution rate and economic benefit. Finally, through the comparative analysis of the design and test data, this paper concludes that EnergyPlus will optimize the multiperformance parameters of the near-zero energy consumption residential building scheme stage. At the same time, the multiobjective optimization method and process of the passive energy-saving technology of the near-zero energy consumption building proposed in this paper, as well as the technology combination template under different needs, provide a reference for the selection of the technology path.

Data Availability

The figures used to support the findings of this study are included in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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