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Research Article

Deep Learning for an Innovative Photo Energy Model to Estimate the Energy Distribution in Smart Apartments

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The outer surface of the building is the same size as its premises, with greater heat loss. Therefore, when building, renovating, or expanding apartment, if possible, avoid all kinds of spaces, ledges, and lodges in the walls. It makes sense to build unheated exterior buildings on the north side of the apartment. The storage rooms for garden tools and bicycles, technical buildings protect the warm part of the house from wind and cold. In the most common design of a private apartment, the energy consumption for heating is 110-130 kW per 1 m^2 per year. In this paper, an energy distribution model was proposed to estimate the photo energy with the help of deep learning model. A small apartment not only uses less energy but also requires lower construction costs. An energy-efficient apartment is a building with a low-energy consumption and comfortable microclimate. Energy savings in such homes can be up to 90%. Annual heat demand can be less than 15 kWh per square meter of energy-efficient home.

1. Introduction

In the context of strict energy consumption standards, heating systems for homes that meet new requirements play an important role in their storage [1]. For example, significant energy savings can be achieved by using self-regulating low-pressure systems that respond quickly to changes in room temperature [2]. When the rooms are heated by sunlight passing through the windows, the corresponding sensors can send a signal to the measurement valves. Accordingly, the boiler will work for less time, and gas consumption will be reduced [3]. In this case, a good service plate when heating your home can be provided by heating batteries and convectors with low recession. Heating with floor heating and a tiled stove cannot operate quickly due to the large hot mass [4–7]. The availability of fuels including petroleum and coal is decreasing. Also, their use increases global warming and affects the environment. Therefore, renewable energy sources such as wind turbines and solar panels will meet the energy demand in the future. In this context, promotion of solar power generation can be a visionary and permanent solution. The use of coal and petroleum products continues to increase due to the industrial revolution and the proliferation of vehicles. The boiler must use efficient energy and comply with nonemissive standards of harmful substances in the atmosphere [8]. Nowadays, these requirements are met by condensing boilers running on liquid fuel or gas, as well as very efficient gas steam boilers [9]. Own home question arises to reduce power consumption if needed [10–12].

(i) The zero or very low typical energy consumption was achieved up to 10% [13]

(ii) Insulation should be at least 25-30 cm in one layer walls and 50 cm in attic bases

(iii) With a powerful, at least 40 cm insulation layer, all systems that use and recycle thermal energy are fitted so that it has almost no external energy losses

First, the thermal insulation of all elements of the house must be improved. Heating a well-insulated house requires a more compact and less powerful heating system, but is well-regulated as shown in Figure 1. It uses the energy of the sun, with windows facing south. In the energy supply, in addition to the phase energy, one or more alternating currents (wind generators and solar panels) are among the mandatory properties, such as a heat collector, daily energy saving device, recuperate for incoming air heating or cooling, and the use of ice to preheat the ventilated air in winter [14–18]. In summer, the same outside air on the floor is precooled with positive electrical balance. With a powerful, at least 40-cm insulation layer, all systems that use and recycle thermal energy are fitted so that it has almost no external energy losses [19]. Many sources of renewable alternative energy are fitted. Excess electricity can be sold to support outdoor buildings or to the public grid [20]. The technical specifications are passive and similar to that of an intelligent home. Energy derived from the grid, but mainly from its own sources, is used wisely, with the help of intelligent control [21]. The heating system provides seasonal energy storage, which heats the house during the hot season without the use of external energy resources [22]. Capacity is an economic concept with a certain set of minimum costs. Choose special care, high-quality, and durable insulation for the home. Insulation layer of walls and roofs of houses with minimum requirements minimum energy starts from 15 to 20 cm [23]. Walls, foundations, insulation materials, heating equipment, and pipes differ in their physical, mechanical, and chemical properties [24]. For example, it is better to insulate foundations with extruded polystyrene foam with high mechanical strength and practically zero hygroscopicity [25]. These insulation defects include high fire risk (toxicity

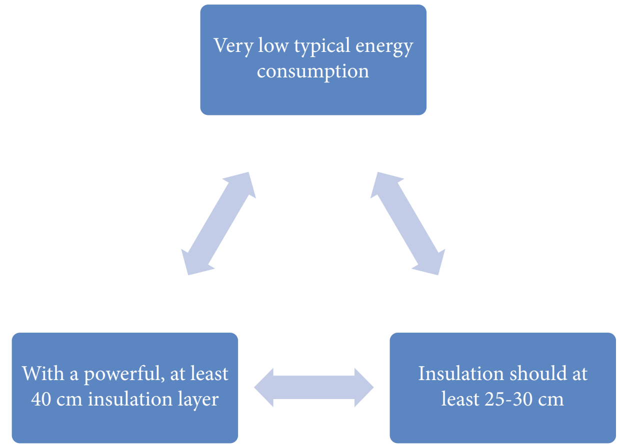

Figure 1: Powerful heating system.

of combustible materials) and sensitivity to ultraviolet light (protection from exposure) [26]. Due to the use of petroleum and coal, the environmental damage is severe. To solve all this, we are forced to use nonconventional and renewable energy. Among these, wind and solar energy play an important role. However, due to difficulties in generating and storing electricity from solar energy, there was initial reluctance to increase their use. However, the current modern technological development helps to remove these obstacles.

Of course, well-thought-out structured thermal insulation, minimal cold bridges, is one of the key components, but only from a distance [27]. A real energy-efficient house starts at the design stage and lays the foundation, which is well-insulated and waterproofed at the initial stage of construction [28]. There are no trivial things in such a house, and every element in the architectural look is thought out, the size of the house, its shape, the number of elongated elements, polishing, and looking at the sun. Roofing and wall insulation Brick, expanded clay concrete, foam concrete, aerated concrete, wood concrete, etc. are “breathable” materials used to construct wooden and stone homes. Due to its microscopic structure and antiseptic properties, it makes corrosion resistant and corrosive structures. Consequently, stone walls started to grow mold. Besides, it is durable, cheap, and fireproof [29]. However, there are many heaters, each of which has its own characteristics and characteristics that, accordingly, should be used for its intended purpose. With excellent thermal insulation and ceiling, the mandatory attributes of an energy-efficient home are a well-thought-out ventilation system (in older homes, it gives up to a third of the energy loss). An energy-efficient house, by definition, cannot heat the street rejected by hot air vents. The counter will solve the problem of heating the new incoming air through the counter-flow removed from the chamber [30]. A simple heat exchanger will solve the problem of preheating the incoming water using waste heat. To heat an energy-efficient house, it is necessary to use the energy of the sun, for which the building faces most of the windows to the south. Glass with two, three chambers glazed, glass with special film coating that transmits sunlight spectrum and reflects infrared radiation [31]. Heating is one of the most important components of an energy-efficient

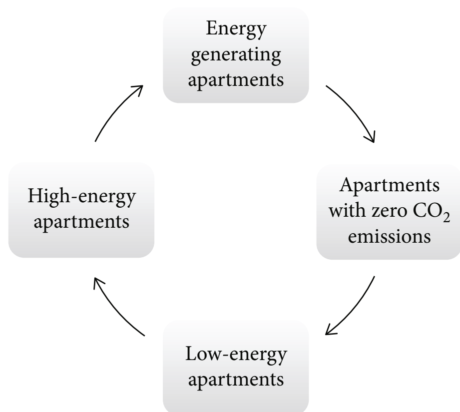

Figure 2: Different types of apartments.

home. It can be a core gas, electric, use the energy of the earth, wind, or sun, but it is also associated with an energy-saving device to remove peak loads. For example, there is a night charge for electricity with significant discounts in the area, and the basis for heating may be an electric boiler, with a tank of several tons of water. Heated water at night will cope with heating the house during the day. An alternative to water energy storage is in concrete screed floor which is huge. This will retain enough energy to keep the room at a comfortable daytime temperature.

2. Literature Review

One of the most important factors affecting the consumption of energy resources of the house is its location relative to the cardinal points. Most home windows should face south. At the same time, a deflection of up to 30 south of the azimuth slightly reduces the use of solar energy [1]. If the house is located differently, the walls and roof of the building should be more effectively insulated to compensate for the lack of heat entering the room from sunlight. About 90% of the light energy penetrates through the glass of the windows and heats the room [2]. Modern double-glazed windows are made with special coatings and inert gas filling. The coatings reflect the long wave infrared rays back into the room from the room, minimizing their loss through the windows [3]. Because of the large windows, the house will be much warmer in summer. This problem is solved by using another special glass coating, as well as automatic darkening systems, roof eves, and balconies [4]. They only allow direct sunlight to pass through the windows when the sun is low in winter. In summer, the windows on the sunny side of the house are shaded by trees. In winter, sunlight penetrates the house easily between the bare branches [5]. The use of nonconventional energy has become the imperative of the times. In particular, it is necessary to make full use of solar energy. As countries including India get more than 300 days of sunlight in a year, its use should be increased. This energy is not available at night, when it rains. Therefore, it is important to stock up when available. Current technology has solved these problems. Many countries have installed large-scale solar panels at sea to generate electricity from sunlight. The more solar thermal equipment is used, the lower the cost. Also, imports of petroleum crude oil can be drastically reduced. Similarly, the use of firewood and coal can be reduced and the forest can also be protected.

Most of the heat escapes from the house through its exterior tile. The greater the difference between indoor and outdoor temperatures creates the greater the heat loss. The amount of thermal insulation of a house is determined by the coefficients of resistance to heat transfer of its covering structures (floor, walls, windows, and roof). The higher it is, the better the insulation quality [6]. No creative and high-tech tricks will create comfort for residents without the equipment to regulate the energy processes in the home according to the given instructions. At night, for example, the temperature in the home should be lowered and ventilation reduced to create a more comfortable feeling [7]. A good trick to saving energy is to use both temperature regimes at home reduced to normal and minimum safe level. For the period when there are no tenants in the house, it is better to reduce the ventilation. Smart appliances can rationally regulate the operation of home appliances, controlling and minimizing energy consumption to a minimum [8]. Building an energy-efficient home will increase its cost by 7-15%, but even with less electricity, the reduced energy consumption will be up to 50%, which will provide many times more savings during operation. Good luck with your tireless struggle for energy efficiency at home, i.e., comfort and convenience in it [9]. Industrial establishments were provided with facilities to generate and use solar power during the day and use distributed power at night. Solar power generation is permitted only in factories having a capacity of approximately 3,000 and 4,000 KW and having a separate power feeder. Due to this, a large number of factories are unable to generate solar power. Companies that were producing 300, 400, and 500 kilowatts of solar power had to stop producing solar power [10].

3. Proposed Model

A "passive" house is a house with excellent thermal insulation, minimal electricity, and thermal energy. It mainly maintains a comfortable microclimate with human heat, solar energy, and household appliances such as kettles and stoves. Passive home technologies (buildings with very low-energy consumption and no traditional heating system) are efficient and have already been tried and tested in harsh climates. There are practically no heat losses in such homes shown in Figure 2.

3.1. Low-Energy Apartments. Uses at least 50% less energy than standard buildings built to current energy standards. Generally, when electricity is carried through wires, about 20 percent is wasted. This is why the electricity board gets high compensation. Only 5 percent of global electricity is compensated. By reducing the wastage of electricity through modern technological methods, the losses can be recovered. In this way, thousands of crores of rupees can be saved. Also, the manpower capacity of the power board should be increased. The workforce needs to be upgraded to fully handle modern technologies.

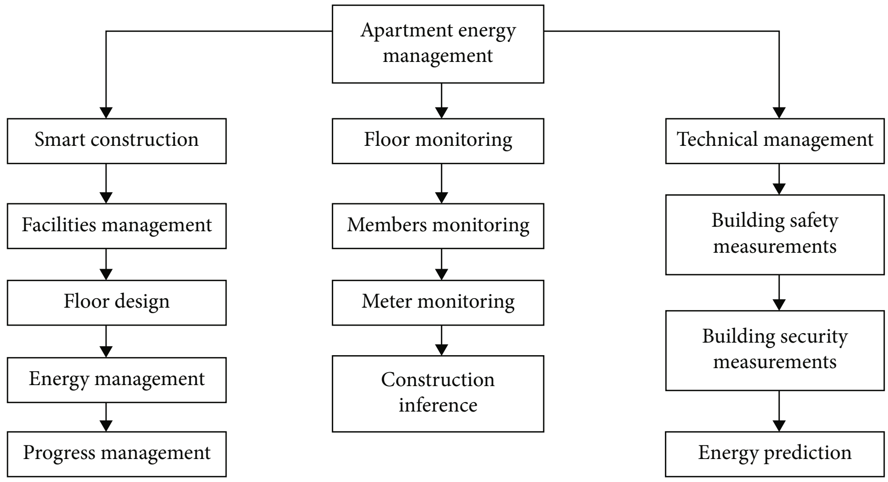

Figure 3: Apartment energy management.

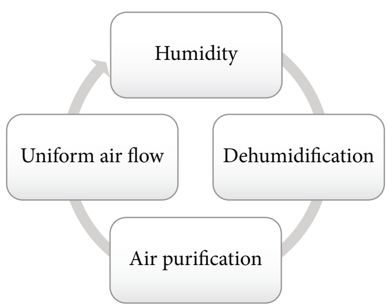

Figure 4: Construction of energy-efficient apartment.

3.2. High-Energy Apartments. They are 70-90% less energy consuming than ordinary buildings of ultra-low-energy homes with clearly defined requirements. The pioneer in the construction of such houses was the dormant house (dormant house), which is generally accepted as a "dormant" building if it meets the requirements created for dormant buildings.

3.3. Energy-Generating Apartments. These are buildings that generate electricity for their own needs. In some cases, the surplus energy can be sold to an energy company in the summer and repurchased in the winter. Good thermal insulation, innovative design, and use of renewable energy sources (solar panels and floor heat pumps) make these homes pioneers of modern home construction. The power can be obtained directly from the sun. But it can get little power when it is surrounded by rain. Solar energy is used all over the world. Also, the use of solar energy to generate electricity or heat and convert seawater into fresh water is becoming increasingly popular.

3.4. Apartments with Zero CO_2 Emissions. This house does not emit CO_2. This means self-sufficient energy from home renewable sources, including space heating/cooling, hot water supply, ventilation, lighting, cooking, and electrical appliances.

The apartment energy management system is demonstrated in Figure 3. Initially the smart construction plans are listened and prepared as per the specifications. Then, the facilities are listed, and the list of services is demonstrated. Then, the floor design and energy management equipments are mounted as the construction plan was proposed by the specified supervisor. Now, it is the time to list the energy equipments of the apartment. The energy equipments are listed, and the suitable devices are mounted in the floor. These mounted equipments are started progression. This progress management was very efficient. The interior is the only part of the sun that generates significant amounts of heat through fusion. In fact, 99% of the energy produced by the sun takes place within 24% of the sun's radius. By 30% radius, fusion has almost completely ceased. The remainder of the sun is transferred from the interior through successive layers, eventually reaching the heliosphere and escaping into space as sunlight or particle kinetic energy. The following parameters are important in the construction of energy-efficient apartment, and it is shown in Figure 4.

3.4.1. Humidity. The device can provide optimal performance -50% humidity at a temperature of 22 degrees. The built-in element of the outdoor unit extracts moisture from the air masses and distributes it evenly throughout the room.

3.4.2. Dehumidification. The device removes excess moisture from the room without lowering the temperature, which is especially important in the fall and spring. On hot summer days with high humidity, you can dry and cool the air masses in the room using a slip system. The two-stage of air purifications are in outdoor and indoor units. Installing a phytocatalytic filter allows not only the removal of dust and small insects from the air masses, but also the removal of formaldehyde, viruses, and mold; ensuring uniform air flow, wide-angle dampers can be operated downwards or upwards so that air masses are "spread" around the room. Solar energy is the conversion of sunlight into electricity. Sunlight can be directly converted into electricity using photovoltaic cells or indirectly through fully integrated solar power (ISP). Generally, water is boiled by concentrating

Table 1: Exterior thickness management.

No of inputs	LVRMM	DLCA	ADSM	FPSMM	EDDLM
100	62.95	71.19	83.98	86.23	95.43
200	61.46	69.22	81.56	84.03	93.01
300	59.97	67.25	79.14	81.83	91.02
400	58.48	65.28	76.72	79.63	89.03
500	56.99	63.31	74.3	77.43	87.04
600	55.5	61.34	71.88	75.23	85.05
700	54.01	59.37	69.46	73.03	83.06

Table 2: Noise protection management.

No of inputs	LVRMM	DLCA	ADSM	FPSMM	EDDLM
100	60.66	68.09	81.15	83.23	91.81
200	58.36	66.96	79.55	82.56	91.33
300	56.06	65.83	77.95	81.89	90.85
400	53.76	64.7	76.35	81.22	90.37
500	51.46	63.57	74.75	80.55	89.89
600	49.16	62.44	73.15	79.88	89.41
700	46.86	61.31	71.55	79.21	88.93

Table 3: Climate change management.

No of inputs	LVRMM	DLCA	ADSM	FPSMM	EDDLM
100	57.32	66.51	77.23	81.13	89.90
200	56.68	65.06	75.98	80.04	89.74
300	56.02	64.58	73.25	79.56	87.97
400	55.37	63.45	71.51	78.67	87.27
500	54.72	62.49	69.52	77.89	86.31
600	54.07	61.52	67.53	77.10	85.34
700	53.42	60.56	65.54	76.32	84.38

Table 4: Heat loss and cold bridges management.

No of inputs	LVRMM	DLCA	ADSM	FPSMM	EDDLM
100	52.15	76.65	74.46	82.70	96.13
200	52.26	77.15	74.46	83.79	96.39
300	52.32	77.9	75.29	84.93	96.96
400	52.41	78.48	75.57	86.04	97.32
500	52.50	79.11	75.98	87.15	97.74
600	52.58	79.73	76.40	88.27	98.15
700	52.67	80.36	76.81	89.38	98.57

the sun's energy into the water. Electricity is produced by this method.

Determine the magnitude of the exhaust or supply flow using

$$F_A = S * A, \tag{1}$$

Table 5: Thermal insulation management.

No of inputs	LVRMM	DLCA	ADSM	FPSMM	EDDLM
100	52.37	77.9	74.56	84.57	95.82
200	52.41	76.85	73.45	83.04	94.80
300	52.45	75.8	72.34	81.51	93.78
400	52.49	74.75	71.23	79.98	92.76
500	52.53	73.70	70.12	78.45	91.74
600	52.57	72.65	69.01	76.92	90.72
700	52.61	71.60	67.90	75.39	89.70

where F_A is the desired value of the air flow, S is the size of the room, and A is the number of air updates per hour.

For example, an apartment is 65 square meters. And a ceiling height of 2.5 m, with an optimal air flow $(65 * 2.5)/2 = 81.25$ cubic meters/h.

Calculate the airflow using the following equation

$$S = \frac{L}{(W * 3600)} \tag{2}$$

where $W = 1\,m/s$ and the value is used to connect the 3600 time units. Therefore, $S = 81.25/3600 = 0.02257\,sq.m.$

Scientists believe it started when a cloud collapsed under its own gravity, a term known as the cloud theory. It not only created a great ball of light at the center of our solar system, but also triggered a process. Through this, the nitrogen collected in the center began to combine to generate solar energy. The process, technically known as nuclear fusion, releases incredible amounts of energy in the form of light and heat. But getting that energy from the core of our sun out to Earth and beyond involves some important steps. Ultimately, these all come down to layers of the sun, and each has a role to play in ensuring that solar energy gets to where it helps create and sustain life. Convert the value obtained according to the formula to the value of the radius in

$$R = \frac{\sqrt{S}}{\pi}. \tag{3}$$

According to the example, the pipe radius is .00.02257/3.4 = 0.085 m or 8.5 cm. The diameter should be taken with rounding up about 20 cm. The inner part of the sun extends from its center to about 20–25% of the solar radius. It is in the interior that energy is produced by the conversion of hydrogen atoms (H) to helium (He) molecules. This is possible due to the extreme pressure and temperature in the interior, which are estimated to be equivalent to 250 billion atmospheres (25.33 trillion KPa) and 15.7 million Kelvin, respectively. Two positrons are released from this process, as well as two neutrinos (which convert two electrons into negative electrons) and energy.

4. Results and Discussion

The proposed energy distribution deep learning model (EDDLM) was compared with the existing low-voltage

Table 6: Solar energy management.

No of inputs	LVRMM	DLCA	ADSM	FPSMM	EDDLM
100	52.44	76.57	73.05	82.40	94.56
200	52.46	77.29	73.62	82.98	95.21
300	52.48	78.01	74.19	83.56	95.86
400	52.50	78.73	74.76	84.14	96.51
500	52.52	79.45	75.33	84.72	97.16
600	52.54	80.17	75.90	85.30	97.81
700	52.56	80.89	76.47	85.88	98.46

Table 7: Heat supply management.

No of inputs	LVRMM	DLCA	ADSM	FPSMM	EDDLM
100	55.62	84.35	72.52	79.89	89.87
200	58.04	86.55	74.51	81.38	91.84
300	58.45	87.35	75.71	82.18	92.97
400	60.20	89.08	77.44	83.44	94.66
500	61.62	90.58	79.03	84.59	96.21
600	63.03	92.08	80.63	85.73	97.76
700	64.45	93.58	82.22	86.88	99.31

Table 8: Energy efficiency management.

No of inputs	LVRMM	DLCA	ADSM	FPSMM	EDDLM
100	60.05	88.02	76.19	84.51	94.18
200	62.37	89.45	77.62	85.52	94.55
300	63.62	90.54	77.78	86.16	96.08
400	66.35	91.02	78.55	86.82	96.58
500	68.14	92.28	79.35	87.65	97.53
600	70.15	93.29	80.07	88.40	98.40
700	72.17	94.30	80.79	89.16	99.28

residential micro-grids management (LVRMM), decentralized load control architecture (DLCA), autonomous demand-side management (ADSM), and fuzzy probabilistic based semi-Morkov model (FPSMM).

4.1. Exterior Thickness. Table 1 shows the comparison of exterior thickness management. The size of the future living space in the house directly depends on the thickness of the exterior walls. If the walls are thick, say 38.5 cm, rather than 32 cm. Living space will decrease significantly. So, in a house with an area of 10×11 m with walls of a certain thickness, its living area will lose 2.73 meters at each site. This means more houses per square meter! With a wall thickness of 49 cm, the living area on each floor is reduced to about 8 m^2.

4.2. Noise Protection. The sound insulation of the walls and structures of a house directly depends on the density and texture of the material from which they are made. When designing a home, it is important to focus on isolating yourself from shock and noise. Solid (without windows and doors) walls, for example, made of fiber-reinforced concrete with a thickness of 250 mm, fully meet the requirements of comfort. Sound insulation of walls with more than 25% partial windows is no longer as effective: In this case, a significant portion of the noise penetrates through the windows. Here, first of all, special measures for sound insulation will be required. Table 2 shows the comparison of noise protection management.

4.3. Climate Change Management. The concept of "comfort at home" has many different meanings. Some believe that a house made of baked clay bricks is more comfortable, while others prefer silicate bricks, while others prefer wood over a frame system. A comfortable microclimate is a balanced combination of all these elements in the construction of a house. Table 3 shows the comparison of climate change management.

4.4. Heat Loss and Cold Bridges. When insulating a house, special attention should be paid to areas that have lost heat or are known as "cold bridges." In these places, the heat goes out more intensely than the others. An example is balconies with roofs in the form of a solid slab and window slopes or joints between exterior walls and basement. To minimize heat loss and avoid possible damage to structures (e.g., mold formation on them due to perspiration), it is important to take this into account even during the design and construction phase of the house. Particular attention should be paid to sealing joints in windows, doors, roofs, and installation of roller shutter housings. Table 4 shows the comparison of heat loss and cold bridges management.

4.5. Thermal Insulation. If previously it was believed that insulation with a thickness of 10 cm (mineral fiber mats or polyurethane foam sheets) is sufficient for roof insulation, now more stringent standards apply to roof insulation. For roofs of energy-efficient ("heated") houses, the resistance to heat transfer should be at least 6 W/m^2,i.e., the thermal conductivity coefficient of 0.04 W/m^2K (at equilibrium humidity) and thermal insulation thickness of a material made of at least 24 cm. However, the most effective and greatest comfort is the heating system with infrared film heaters, whose efficiency is 92-97%. Table 5 shows the comparison of thermal insulation management.

4.6. Passive and Active Solar Energy. Table 6 shows the comparisons of solar energy management. The use of double-glazed windows with low heat transfer coefficient allows to save energy resources. The modern market offers double-glazed windows even with $K_t = 1.3 - 1.1\ \mathrm{W}/(\mathrm{m}^2 - \mathrm{K})$. Double-glazed windows and luxury class $(0.9 - 0.8\ \mathrm{W}/(\mathrm{m}^2 - \mathrm{K}))$, but they are more expensive. With energy savings, double-glazed windows create comfort in the premises. Or the use of a glass unit with a heat transfer coefficient of 1.11 W/m^2-K does not lead to a sharp increase in the price of the window, for example, unlike the use of glued angora pine wood frames.

4.7. Heat Supply. Passive house is a heated house with minimal consumption of heating medium. Your home will be heated by an integrated system, which includes a gas dual circuit boiler and a heat pump. The heat pump requires a submersible drainage sump pump. Double steel pipe weave is reduced to a depth of 100 m. The upper half of the pipes' thermal insulation. The heat pump is driven through the tube by the liquid mixture antifreeze type. At depth, the mixture heats up and provides heat inside the house. The heat is pumped through the cooling system by the pumps. A solid fuel boiler is installed to heat the water. It is heated by waste and wood waste. Energy saving dual cycle boiler burns waste without leaving any smoke. Table 7 shows the heat supply management.

4.8. Energy Efficiency. Based on the most recent technological advancements, energy represents the achievement of economically sensible use of energy resources. This does not mean reducing anything or losing anything. The goal of achieving maximum energy efficiency in the home is achieved primarily by minimizing heat loss thermal energy in all energy processes without affecting the end result of rational use. Table 8 shows the comparison of energy efficiency management.

5. Conclusion

Generally, forced ventilation in the apartment provides for its maintenance, for which the interior surfaces and filters should be cleaned once or twice a year, depending on the intensity and frequency of use. In the process, you will remove the built-ups on the grills and visors with a vacuum cleaner or other suitable method. It is necessary to wipe the damping surfaces of the housing and device using a damp cloth. Supply and exhaust ventilation in the apartment, home or office will improve the quality of human life. After all, fresh air is essential for the normal functioning of the brain. For proper well-being, having fresh air in the apartment is the most important point. $3\,m^3$ of fresh air should be supplied to $1\,m^2$ of covered area. There is a rule for an adult who needs $30\,m^3$ of air per hour. Due to the fact that the fan is powered by current, it is necessary to check the condition of the power cable and connections. If the operation is irregular, the equipment should be operated for 5 or 10 minutes, once a quarter. If forced ventilation is installed in an apartment with your own hands, it must comply with the requirements of the SNiP, and the use of additional devices such as controllers, controllers, timers, and sensors will improve energy costs and extend their life.

Data Availability

The data used to support the findings of this study are included within the article. Further data or information is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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