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THE ISSUE OF PROVIDING MULTI-APARTMENT BUILDINGS AND THEIR ADJACENT AREAS WITH SOLAR PHOTOVOLTAIC MODULE ENERGY

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Annotation. One of the most prioritized directions in the global practical use of solar energy is the use of solar panels in urban planning to generate energy from alternative energy sources [1]. In our Republic, the use of solar photovoltaic modules as an energy source is being implemented on a large scale. To achieve these goals, the installation of solar photovoltaic modules on buildings and adjacent areas is increasing significantly. The purpose of this article is to develop proposals for solar photovoltaic modules that will make a significant contribution to achieving efficiency through solar energy in multi-apartment buildings and their surrounding areas.

Key words: Multi-apartment building, energy, solar photovoltaic module energy, urban planning, street lighting, car parking areas.

Annotatsiya. Respublikamizda quyosh fotoelektrik modul energiya manbasidan foydalanish keng ko'lamda amalga oshirilmoqda. Shu maqsadlariga erishish uchun binolar va unga tutash hududlarda quyosh fotoelektrik modullarini joylashtirish keskin oshadi. Ushbu maqolaning maqsadi ko'p kvartirali uylar va uning tutash hududini quyosh fotoelektrik modul energiyasi orqali samaradorlikga erishishga katta xissa qo'shadigan quyosh fotoelektrik modullariga takliflar ishlab chiqish.

Kalit soʻzlar: Koʻp kvartirali uy, energetika, quyosh fotoelektrik modul energiyasi, shaharsozlik, koʻcha chiroqlari, avtomobillar turar joylari.

Аннотация. В нашей Республике использование солнечных фотоэлектрических модулей в качестве источника энергии осуществляется в широком масштабе. Для достижения этих целей значительно увеличивается установка солнечных фотоэлектрических модулей на зданиях и прилегающих к ним территориях. Цель данной статьи — разработка предложений по солнечным фотоэлектрическим модулям, которые внесут значительный вклад в повышение эффективности использования энергии солнечных модулей в многоквартирных домах и прилегающих к ним территориях.

Ключевые слова Многоквартирный дом, энергетика, энергия солнечных фотоэлектрических модулей, градостроительство, уличное освещение, парковки для автомобилей.

Introduction:

In the "Uzbekistan — 2030" strategy, a number of important objectives have been outlined. Among them, enhancing the efficiency of solar photovoltaic modules, optimizing their key parameters, and developing solutions for modeling the conversion of solar energy into electricity are considered as crucial tasks.

The above analysis indicates that in urban planning, promoting rational use of energy and strengthening the country's energy policy through relevant legislation is essential. This includes increasing awareness among the population and youth, especially regarding the use of alternative energy sources. It also involves encouraging greater participation of self-governing bodies and the wider public in this process.

In this context, several important documents have been adopted, such as:

- The declaration of 2025 as the "Year of Environmental Protection and Green Economy" by the President of the Republic of Uzbekistan

- The Presidential Decree PQ-100 dated March 11, 2025, “On measures for fundamental reform of the heat supply system for residential and building structures and improving energy efficiency of buildings”

- The Presidential Decree PF-158 dated September 11, 2023, “On the Uzbekistan — 2030 Strategy”

- The Presidential Decree PQ-57 dated February 16, 2023, “On measures to accelerate the introduction of renewable energy sources and energy-saving technologies in 2023”

- As well as the Cabinet of Ministers' decisions, including the "Concept for Supplying the Republic of Uzbekistan with Electric Energy for 2020–2030" and the Resolution No. 13 dated January 8, 2024, “On regulating and developing the field of energy supply based on renewable energy sources”

These documents highlight the presence of several urgent issues in urban planning and the need for strategic approaches to sustainable energy development.

Materials and Methods Used:

During the research process, it was determined that integrating solar photovoltaic modules with urban planning enables the creation of extensive energy generation areas and facilitates the transition of multi-apartment buildings into passive houses.

According to urban planning norms and regulations, the normative document SNQ 2.08.08-22 titled “Passive Houses” defines a passive house as a building whose specific energy consumption for heating does not exceed an average of 15 kWh per square meter annually, with minimal negative environmental impact. These houses use renewable energy sources, including solar energy, and are equipped with energy-efficient and energy-saving technologies for heating, ventilation, and air conditioning systems [2].

Moreover, SHNQ 2.08.08-22 references several normative documents related to technical regulation, among which the following are relevant to this scientific research:

- SHNQ 2.01.01-23 “Climatic and Physicogeological Data for Design” [3];
- SHNQ 2.04.15-22 “Photovoltaic Power Stations (Systems)” [4].

Several experiments were conducted on the issue of achieving efficiency by supplying multi-apartment buildings with solar photovoltaic module energy (see Figure 1). Additionally, specific recommendations were developed for lighting systems in the surrounding areas of such buildings.

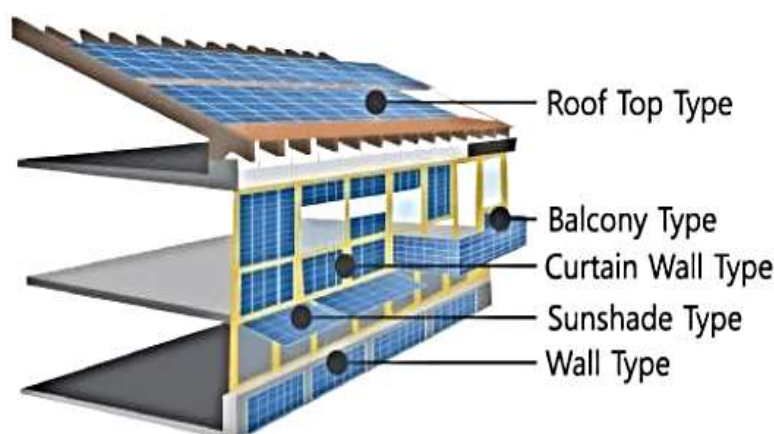


Figure 1. Achieving Energy Efficiency Through Solar Photovoltaic Modules

Based on the aforementioned urban planning norms and regulations, as well as international best practices, a study was conducted in collaboration with “TELECOM SOLARDEVICE” LLC, which operates in our Republic. The research focused on evaluating the efficiency of supplying adjacent areas of multi-apartment buildings with solar photovoltaic module energy. As a result, several project model prototypes operating under different conditions were developed, as shown in **Table 1** [4].

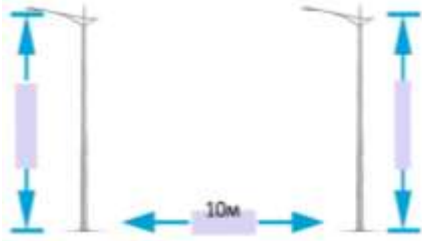
Table 1



TDP –
90W1

450.000 soums

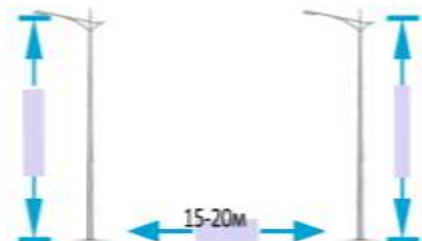
Model No	TDP – 90W1
Power	90 Vt
Solar Panels	6 V 9 Vt 399*214 mm
Battery (Li-PO ₄)	3.2 V 10 Ah



TDP-
120W6

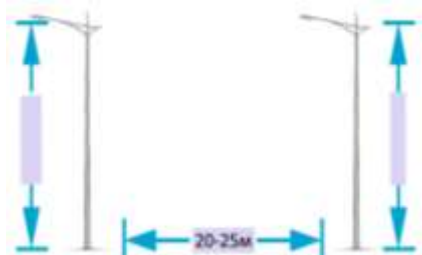
550.000 soums

Model No.	TDP – 120W6
Power	120 Vt
Solar Panels	6 V 13 Vt 507*231 mm
Battery (Li-PO ₄)	3.2 V 15 Ah



TDP-
150W6

Model No.	TDP – 150W6
Power	150 Vt

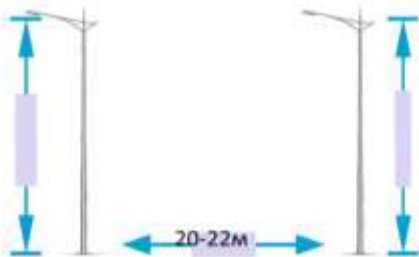


600.000 soums



TDP-300W6

Solar Panels	6 V 18 Vt 606*233m m
Battery (Li-PO ₄)	3.2 V 20 Ah

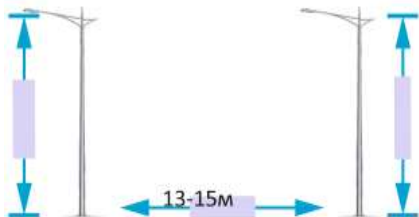


1.150.000 soums



TDP-100W3

Model No.	TDP – 300W7
Power	300 Vt
Solar Panels	6 V 30 Vt 335*590m m
Battery (Li-PO ₄)	3.2 V 30 Ah



100W3

900.000 soums

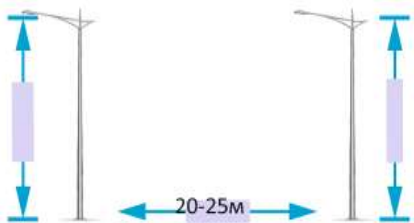
Model No.	TDP – 100W3
Power	100 Vt
Solar Panels	6 V 25 Vt 530*350m m
Battery (Li-PO ₄)	3.2 V 25 Ah



TDP-200W3

1.000.000 soums

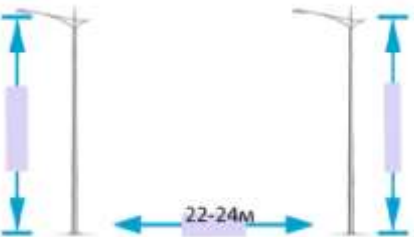
Model No.	TDP – 200W3
Power	200 Vt
Solar Panels	6 V 30 Vt 600*350m m
Battery (Li-PO ₄)	3.2 V 30 Ah



TDP-400W4

1.500.000 soums

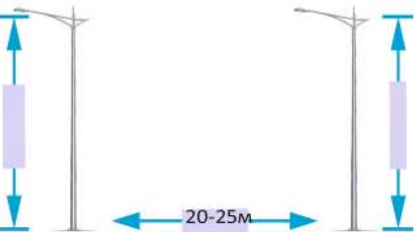
Model No.	TDP – 400W4
Power	400 Vt
Solar Panels	6 V 40 Vt 670*445m m
Battery (Li-PO ₄)	3.2 V 40 Ah



TDP-400W8

1.250.000 soums

Model No.	TDP – 400W8
Power	400 Vt
Solar Panels	6 V 30 Vt



	335*590m m
Battery (Li-PO₄)	3.2 V 40 Ah

Based on the work presented in Table 1, it can be concluded that supplying the adjacent areas of multi-apartment buildings with solar photovoltaic module energy can significantly reduce the overall energy consumption in those areas.

Additionally, in Uzbekistan, the modernization and reorganization of car parking areas near multi-apartment buildings in a new, contemporary format is increasingly becoming a necessity. It is worth noting that during the research process, it was found that the number of personal electric vehicles powered by rechargeable batteries is steadily growing.

To charge these vehicles, electricity can either be purchased from the central power grid or, alternatively, parking areas can be designed using solar photovoltaic modules. This would enable the creation of small-scale power stations capable of generating electricity independently (see Figure 2).

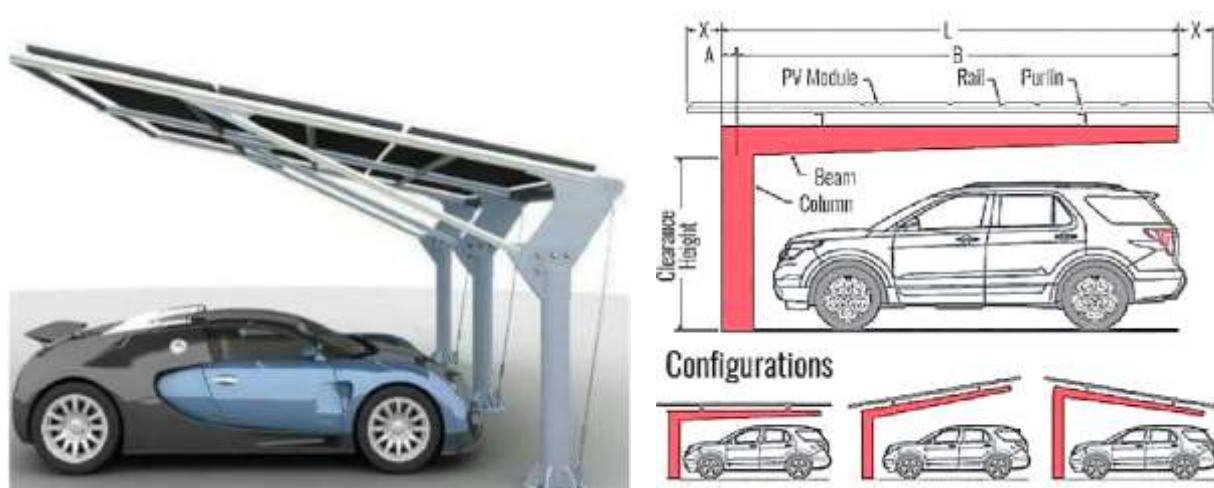




Image 2. Modern Design of Car Parking Areas Using Solar Photovoltaic Modules

Several proposals have been developed in order to improve efficiency by integrating solar photovoltaic modules into the modernization of car parking areas depicted in Image 2. These proposals aim to supply solar photovoltaic energy to multi-apartment residential buildings and their adjacent areas within the framework of urban planning.

Conclusion.

It is evident that, despite the ongoing reforms regarding solar photovoltaic modules in our country, their implementation remains limited and incomplete. At the same time, energy consumption in multi-apartment buildings and their adjacent areas continues to grow significantly. Therefore, based on international experience, several modern projects have been developed that integrate solar photovoltaic modules for effective utilization in multi-apartment residential complexes and their surrounding territories.

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