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Research Of Autonomous Energy Supply Systems In Decentralized Energy Zones.

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ABSTRACT
Based on renewable energy sources, it is aimed at analyzing and managing the optimal energy consumption of the autonomous energy system in the Kashkadarya region of the Republic of Uzbekistan. The main dimensions and parameters of a mobile home with an autonomous energy supply system based on completely alternative energy sources for heat and electricity consumers in areas far from centralized energy supply are presented. Based on the energy analysis of the traditional energy distribution systems of local consumers, the principle scheme of the mobile energy distribution system of local consumers was developed based on alternative energy sources. Processes for the formation of load schedules for autonomous consumers are provided. The average installed power and the critical minimum load of an autonomous residential building were determined, which do not exceed 20 kW and 2 kW, respectively. In order to save money when creating an autonomous generator complex, it is proposed to create a power supply system with heat load isolation.

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Decentralized energy zones; autonomous energy system; optimal power consumption; solar photovoltaic battery; mobile home; autonomous energy source.

Исследование Автономных Систем Энергоснабжения В Децентрализованных Энергетических Зонах.

Аннотация. На основе возобновляемых источников энергии он направлен на анализ и управление оптимальным энергопотреблением автономной энергосистемы Кашкадарьинской области

Республики Узбекистан. Представлены основные размеры и параметры мобильного дома с автономной системой энергоснабжения на основе полностью альтернативных источников энергии для потребителей тепла и электроэнергии в районах, удаленных от централизованного энергоснабжения. На основе энергетического анализа традиционных систем энергораспределения местных потребителей разработана принципиальная схема мобильной системы энергораспределения местных потребителей на основе альтернативных источников энергии. Предусмотрены процессы формирования графиков нагрузки автономных потребителей. Определены средняя установленная мощность и критическая минимальная нагрузка автономного жилого дома, которые не превышают 20 кВт и 2 кВт соответственно. В целях экономии средств при создании автономного генераторного комплекса предлагается создать систему электроснабжения с изоляцией тепловой нагрузки.

Ключевые слова: децентрализованные энергетические зоны; автономная энергетическая система; оптимальное энергопотребление; солнечная фотоэлектрическая батарея; мобильный дом; автономный источник энергии.

MARKAZLASHMAGAN ENERGIYA ZONALARIDA AVTONOM ENERGIYA TA’MINOT TIZIMLARINI TADQIQ QILISH.

Annotatsiya. Qayta tiklanadigan energiya manbalariga asoslanib, O‘zbekiston Respublikasi Qashqadaryo viloyatidagi avtonom energetika tizimining optimal energiya sarfini tahlil qilish va boshqarishga qaratilgan. Markazlashgan energiya ta’minotidan uzoqda joylashgan hududlardagi issiqlik va elektr energiyasi iste’molchilari uchun to‘liq muqobil energiya manbalari asosidagi avtonom energiya ta’minoti tizimiga ega mobil uyning asosiy o‘lcham va parametrlari keltirilgan. Lokal iste’molchilarning an’anaviy energiya ta’minot tizimlarini energetik tahlil qilish orqali muqobil energiya manbalari asosida lokal iste’molchilarining mobil energiya ta’minot tizimining prinsipial sixemasini ishlab chiqilgan. Avtonom iste’molchilar uchun yuklama jadvallarini shakllantirish jarayonlari nazarda tutiladi. O‘rtacha o‘rnatilgan quvvat va avtonom turar-joy binosining kritik minimal yuklamasi aniqlandi, ular mos ravishda 20 kVt va 2 kVt dan oshmaydi. Avtonom generator kompleksini yaratishda pulni tejash maqsadida issiqlik yukini izolyatsiyalash bilan elektr ta’minoti tizimini yaratish taklif etiladi.

Kalit so‘zlar: Markazlashmagan energiya zonalari, avtonom energiya tizimi, optimal quvvat sarfi, quyosh fotoelektr batariyasi, mobil uy, avtonom energiya manbai.

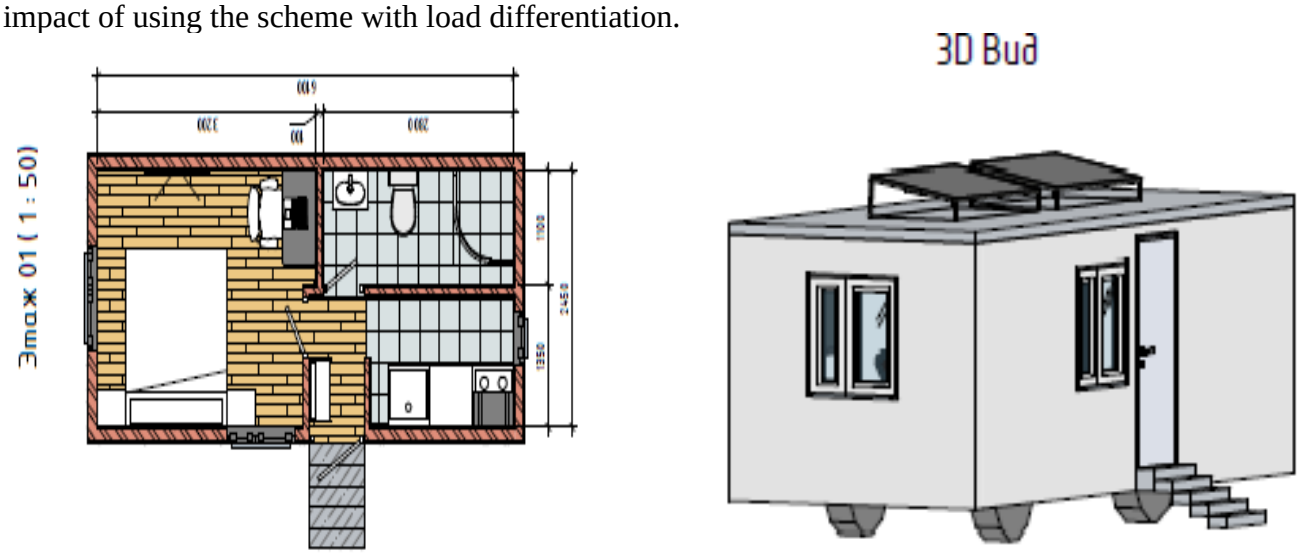
Introduction

By making "green" decisions on the production of electricity, researchers are doing everything to get the most reliable and efficient way to produce energy using renewable energy sources. Therefore, the increased focus on technologies applicable to such large-scale renewable energy sources has led to a permanent reduction in the cost of distributed technologies for generation, storage and conversion of renewable energy. The use of these is particularly attractive and, from a technical and economic point of view, is suitable for supplying electricity to remote areas operating in an autonomous mode. For example, the introduction of renewable energy technologies with their rational use will help to provide electricity to regions with a weak fuel base and poor transport conditions, to solve the problem of efficient use of consumed resources and involvement of regions in the energy balance. [1]

Today, as we know, at the same time that alternative energy is developing, energy shortage and environmental pollution are increasing in beekeeping farms and fishing clusters located far from energy supply. to achieve economic efficiency as a result of system development, implementation of research results. Creation of the cheapest and high-quality insulation part protected from heat and cold. Provision of energy supply systems using alternative energy sources through solar and biogas devices, at the same time creating comfortable living conditions by continuously providing electricity and fuel and hot water supply systems using alternative energy sources. providing a mobile home and offset and justifying its energy efficiency, efficient energy supply designed to improve the living conditions of a part of the population engaged in beekeeping, farms in the desert and mountainous regions with livestock mobile home and office equipped with systems; The instability of renewable energy needs to be balanced with next-generation energy storage

[1] Дарьенков, А.Б. Автономная высокоэффективная электрогенерирующая станция / А.Б. Дарьенков, О.С. Хватов // Труды НГТУ им. Р.Е. Алексеева. – Н. Новгород, 2009. Т. 77. С. 68–72.

equipment and conventional power generation capacity, and as the energy landscape undergoes major changes, smart grids play a central role as a balancer. He takes his place.Power reliability is based on the reliable flow of data using technologies such as smart homes and automatic control functions in energy supply units that allow consumers to control their electricity use. We believe this will increase efficiency and flexibility. International supply chains are expected to continue to be disrupted and energy prices to rise due to increased weather disasters caused by climate change and rising geopolitical tensions. A comparative analysis of the schemes of automated power supply systems was carried out in order to determine the economic impact of using the scheme with load differentiation.



(Scheme 1. Interior and exterior view of mobile home)

Table 1

List of basic materials	
Steel structure	Galvanizing + painting
Canteen	5,90/2,40 / 2/30
Tom	0.6 mm steel plates + 100 mm face insulation steel ceiling
Mirror	Aluminum sliding window with security panel
The door	IEPS fire resistant door
Biogas	65-70 ‘/, CH4
Electrical system	Includes LED lights, sockets, switches, wires and more...
Solar collector	20/58/1.8m Vacuum volume 150 L
Wall panel	40 mm IEPS fire resistant sandwich panel
heating system	Ariston and air conditioner
Floor	18mm MGO board with picture

Objective function; The negative dynamics of the development of the domestic industry and the increase in the level of electricity consumption by the population encourage the Republic of Uzbekistan to expand the scope of research and development aimed at the development of the fuel and energy complex and aimed at saving traditional hydrocarbon sources of electricity. This led to the expansion of new strategies of energy-efficient and cost-effective energy supply to consumers in the Kashkadarya region with the participation of non-traditional and renewable energy sources.

Analysis of literature on the topic

A traditional autonomous energy source must provide long-term uninterrupted power supply to the facility under various environmental parameters. According to this, it was found that the consumer's daily need for electricity was studied depending on the time. Electric load The process of generating electric loads of the consumer of the power supply system increases the probability in nature, therefore, generally accepted methods of probability theory and mathematical statistics can be used to determine the generation and numerical values of the table of consumer loads. Thermal technical parameters of the main energy devices in a mobile home No.

Device and equipment name number characteristic

Table 2

1.	Solar photobattery	1 NF = 2000 Vt
2.	Solar water collector	1 G = 500 l/water (500 liters per day in winter)
3.	Hot water storage tank	1 G = 500 l/suv
4.	Biogas plant	1 V = 0,7 m3
5.	Pyrolysis device	1 V = 1,5 m3

The structural dimensions of the proposed mobile home will vary depending on the needs of consumers, for example, on average, consumers engaged in beekeeping and animal husbandry will have 3-4 people, in agricultural farms 4 - It can accommodate up to 10 people, so the load can change depending on the needs of the mobile home. For statistical data, if we take into account that 24 million people live in rural areas, 7 million of them live in desert areas, this is almost much more than the urban population, so it is necessary to further develop the autonomous energy supply system based on alternative energy sources. means Research methodology Mathematical model of the electricity supply system in areas far from centralized energy supply Let's consider the process of drawing up a load graph of a group of electric receivers of autonomous consumers. Switching off and switching off individual electrical receivers can be considered random events. As it is known, a random process - a load graph - is characterized by a distribution function, a mathematical expectation and a correlation function. It reflects the relationship between process parameters. can be determined by the binomial law from the total number of their simultaneous operation and group load organization. In this case, the probability of n working out of the total number of m electric receivers is determined using the following expression.

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Research methodology

Mathematical model of the electricity supply system in areas far from centralized energy supply Let's consider the process of drawing up a load graph of a group of electric receivers of autonomous consumers. Switching

[2] G.N. Uzakov, Study of a solar air heater with a heat exchanger – accumulator, IOP Conf. Series: Earth and Environmental Scienc, 723, 052013 (2021)

off and switching off individual electrical receivers can be considered random events. As it is known, a random process - a load graph - is characterized by a distribution function, a mathematical expectation and a correlation function. It reflects the relationship between process parameters. can be determined by the binomial law from the total number of their simultaneous operation and group load organization. In this case, the probability of n working out of the total number of m electric receivers is determined using the following expression.

$$P_{(n,m)} = \sum \frac{n!}{m!(n-m)!} p^m (1-p)^{n-m}. \qquad (1)$$

The load model of an "average" autonomous house (house) with a small farm or beekeeping, fishing clusters, which is provided from an autonomous energy source in electricity supply, was considered. Nevertheless, although the type and number of electricity receivers depends on factors such as house type, family structure, family composition, standard of living, district, etc., building some "average" autonomous house model with a small farm possible To create such a model, statistics presented to farm owners in different regions of the Republic of Uzbekistan were developed. The following conclusions can be drawn based on the results of data processing on a set of electrical receivers, their power and annual electricity consumption (Table 3), as well as the typical load schedule of an autonomous consumer: In most households, the installed capacity of electrical receivers does not exceed 15-20 kW.

Table 3

Characteristics of electrical receivers.

	Name	Quantity	W	Number of working hours per day	kWh per year
1	2	3	4	5	6
1	TV set	1	75	5	136,6
2	Iron	1	2000	0,3	219
3	Radio	1	5	3	5.4
4	Air conditioner	1	1700	2	1241
5	Hair dryer (blow dryer)	1	480	0,2	35,04
6	Washing machine	1	1200	0,2	146
7	Electric light (bulb)	4	7	8	81,7
8	Electric pump	1	270	6	591,3

Analysis and results

Construction of daily load schedules of autonomous consumers In this case, it is necessary to carry out systematic measurements of power consumption during the day in order to obtain the annual calculation graph of the consumer. According to this verification methodology, the observed value of the student's criterion should be calculated according to the formula (3) and compared to the standard value of a certain level of significance and the number of degrees of freedom s = n - 2 (n – sample size).

$$T = r_k \frac{\sqrt{n-2}}{\sqrt{1-r_k^2}}. \qquad (3)$$

In this regard, in order to bring the expert load graphs to the general level, the average daily values of the distribution parameters were calculated according to the formulas. [3]

$$\sigma_{cp} = \sqrt{\sigma_{д}^2 + \sigma_{в}^2};$$

$$\overline{P}_{cp} = \frac{\overline{P}_{д} + \overline{P}_{в}}{2};$$

$$\sigma_{cpj} = k_{cj} \cdot \sigma_{cp};$$

$$\overline{P}_{cpj} = k_{j} \cdot P_{cp},$$

Summary;

Research to improve the cost-effectiveness of integrated renewable energy systems, particularly autonomous multi-energy microgrids that play a central role in integrating renewable energy variables as part of global efforts to address climate change motivated by necessity. and decentralization of energy, but also important for ensuring universal reliable access to affordable, reliable, sustainable and modern energy sources. For the considered autonomous energy system, small river hydroelectric power stations are accepted as a renewable energy source, and wind power stations and solar power stations are accepted as alternative sources; energy storage is a balancing source. As a result, the optimal ratio of energy production from alternative sources in the winter season from daily energy consumption is hydroelectric power plants (94.8%), wind power plant (3.8%), solar photovoltaic power plant (0.5%) and energy reserve () is set to be. 0.8%). In summer, there is no need to optimally choose the generation sources, because the entire electrical load can be covered by the energy produced by the hydroelectric plants in this region. The article proposed a mathematical model for minimizing the financial costs of individual producers and consumers.

[3] Онищенко, Г.Б. Новое поколение автономных ветроэнергетических установок / Г.Б. Онищенко, Л.Я. Хаскин // МГОУ-XXI-Новые технологии. 2007. №5. С. 41–47.

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