

Висновок. Виконана модель уособлює в собі поєднання всіх компонентів моделювання. Похибка моделювання не враховувалась в розрахунках при моделювання системи. Тому що було використано данні ДП “НЕК Укренерго” котрі базувалися на реальних даних. Аналітичні методи вимагають проведення великої кількості перетворень і мають досить вузьку сферу застосування в електроенергетиці. Для силового високовольтного обладнання та осередків РУ зі складним розподілом первинних зарядів та струмів доцільно застосування універсальних чисельних методів.

Список використаних джерел.

1. “Основні організаційні та технічні вимоги під час експлуатації розподільних установок та підстанцій споживачів - Охорона праці і пожежна безпека”. Охорона праці і пожежна безпека. Дата звернення: 26 верес. 2023. [Онлайн]. Доступно: <https://oppb.com.ua/news/osnovni-organizaciyi-ta-tehnicni-vymogy-pid-chas-ekspluatsiyi-rozpodilnyh-ustanovok-ta>
2. О.В. Остапчук, П.Л. Денисюк та Ю.П. Матеєнко, Електрична частина станцій та підстанцій: курс лекцій. Київ: КПІ ім Ігоря Сікорського, 2022.
3. СОУ НЕК 20.261:2018 Технічна політика ДП “НЕК Укренерго” у сфері розвитку та експлуатації магістральних та міждержавних електричних мереж.

LOW POWER AUTONOMOUS HYBRID SYSTEMS

Дякону В`ячеслав Русланович, здобувач вищої освіти спеціальності 141

Електроенергетика, електротехніка та електромеханіка

Белали Михайло Костянтинович, здобувач фахової передвищої освіти

спеціальності 141 Електроенергетика, електротехніка та електромеханіка ВСП

«ТЕФК МНАУ»

Миколаївський національний аграрний університет, Україна

Науковий керівник: **Мартиненко В.О.**, кандидат техн. наук, доцент кафедри електроенергетики, електротехніка та електромеханіка

Миколаївський національний аграрний університет, Україна

Many of us have experienced the frustration of sudden power loss, electrical surges, and the damage they can cause to expensive appliances. The solution to these problems lies in alternative energy sources, which have become increasingly accessible in recent years. The early 21st century has witnessed a technological breakthrough in the field of alternative and renewable energy sources, particularly solar energy, making environmentally friendly energy systems more readily available. These independent power systems offer a range of advantages, including uninterrupted power supply, minimal noise, and no environmental pollution. While the initial installation costs of eco-friendly power systems can be relatively high, they prove cost-effective over time, depending on local conditions. This factor has contributed to the growing popularity of alternative energy systems. Challenges remain, including unfamiliar technology to consumers and the lack of domestic production capabilities to manufacture high-quality system components. As a result, reliance on more expensive imported products can hinder the widespread adoption of alternative energy, including solar energy, in various regions. The primary focus of this research is addressing the issue of providing power to remote facilities without relying on the central grid. This challenge can be effectively addressed through the use of solar and wind energy solutions.

Keywords: alternative energy, renewable energy, uninterrupted power supply, solar energy, wind energy.

In recent years, the utilization of clean, non-traditional renewable energy sources to meet the energy demands of various agricultural and industrial facilities has garnered increasing attention. This focus on alternative energy sources is driven by two primary factors: the pressing environmental concerns and the quest for new energy solutions. Traditional fossil fuels like coal, oil, and gas, which have long served as the primary energy sources, are predicted by scientists to be depleted within the next 100-150 years, given the current pace of scientific and technological advancement. Ukraine, like many other nations, has initiated a comprehensive program aimed at conducting research and development activities in the realm of renewable energy sources. This program encompasses various organizational measures to facilitate the industrial-scale production of energy supply systems powered by renewable energy sources. It reflects the country's commitment to addressing environmental challenges and ensuring a sustainable energy future.

The study focused on the power supply for a mobile home, a unique form of housing that also serves as a mode of transportation. This concept, where a dwelling doubles as a means of travel, gained popularity in the early 20th century. Initially, mobile homes were compact, human-habitable vehicles. The first mobile home built on a standard automobile chassis was introduced in 1938 by Jennings. Essentially, a mobile home on wheels is a residence that is purposefully designed and constructed to offer maximum comfort and accommodation for one or more individuals.

Electricity is an essential requirement in modern motorhomes. Even the smallest and most affordable motorhomes come equipped with amenities like lighting, refrigerators, stoves, televisions, and more. These built-in low-voltage devices and appliances in motorhomes are typically powered by a dedicated 12V (or 24V) on-board electrical system, often sourced from a storage battery. Additionally, motorhomes frequently incorporate household appliances designed to run on 220V alternating current.

The necessity for autonomous power sources in recreational vehicle travel arises from the limitations of traditional power supply systems over long distances. This challenge can be effectively addressed by harnessing solar and wind energy solutions.

The primary objective of this research was to design an autonomous power supply system for a motorhome. This study highlights the utilization of solar and wind energy sources. At present, renewable energy is experiencing rapid technological and economic development and is being adopted on a global scale. The advantages of this form of energy are evident: sunlight and wind, as sources of energy, are readily available worldwide. The technologies for converting these energy sources into electricity were initially explored in the late 20th century and continue to be refined, becoming more cost-effective. Furthermore, their longevity and ease of operation make solar and wind installations suitable for local-scale applications.

Throughout the research, the essential equipment for establishing a power supply facility was carefully chosen. The power supply requirements for the facility were also delineated, considering several key specifics: The system must operate independently and include a reserve battery capacity. This is crucial because in the event of an emergency shutdown or an interruption in power generation, some time will be required to rectify any faults; Provision should be made for the potential installation of a gasoline generator to compensate for any electricity deficits; The system should incorporate a high level of redundancy in power generation. This involves a combination of various energy sources to ensure continuous power supply; The design features and secure mounting of the equipment installed on the motorhome need to be taken into account.

These specific requirements are crucial for the effective and reliable operation of the power supply system for the motorhome.

In the designed power supply system, it was determined that wind energy becomes impractical when the average annual wind speed is less than 3.5 m/s. In such cases, solar energy is the preferred choice. After analyzing the solar energy data presented in the graphs, several key observations can be made: The most favorable months for utilizing solar panels are exclusively from March to September. During this period, there are higher levels of total solar radiation, making it the ideal time for solar energy generation; When employing solar panels in December, it is advisable to explore the possibility of a hybrid power plant that combines solar energy with fuel-based electricity sources to meet the heightened demand; In general, powering the facility

with solar energy resources throughout the year is an effective approach. However, it is essential to rely on fuel-based resources only when necessary, ensuring a sustainable and efficient energy supply.

During the simulation of the solar module, it underwent testing under various load and solar radiation conditions. This testing revealed a strong correlation between the manufacturer-provided specifications of the solar module and the characteristics observed when simulated in the Matlab/Simulink environment. The deviation between the simulation results and the passport characteristics remained within acceptable limits. When the inverter was connected to the solar module, it generated the required output voltage for operating electrical equipment. This successful connection confirms the reliability and accuracy of the proposed simulation model.

References

1. On the approval of the Strategy for Environmental Safety and Adaptation to Climate Change for the period up to 2030: Order. Kab. of the Ministers of Ukraine dated October 20, 2021 No. 1363 URL: <https://zakon.rada.gov.ua/laws/show/1363-2021-p#Text>.
2. Christian Bussar, Melchior Moos, Ricardo Alvarez, Philipp Wolf et al, Optimal allocation and capacity of energy storage systems in a future European power system with 100% renewable energy generation // Energy Procedia. 2014. № 46. PP. 40 – 47.
3. William F. Pickard, Amy Q. Shen, Nicholas J. Hansing, Parking the power: Strategies and physical limitations for bulk energy storage in supply demand matching on a grid whose input power is provided by intermittent sources// Renewable and Sustainable Energy Reviews. 2015. № 13. PP. 1934.
4. Jami Hossain, A case study of high wind penetration in the Tami l Nadu Electricity Utility, Energy policy August 2014. PP. 868–874.
5. Andreev V.M., Zabrodsky A.G., Kognovitsky S.O. Integrated power plant with an energy storage on the basis of the hydrogen cycle // International Scientific Journal for Alternative Energy and Ecology. 2017. №2 (46). PP. 99–105.
6. Zhang, H. L., et al. "Concentrated solar power plants: Review and design methodology." Renewable and sustainable energy reviews 22 (2013): 466-481.
7. Pavlović, Tomislav M., et al. "A review of concentrating solar power plants in the world and their potential use in Serbia." Renewable and Sustainable Energy Reviews 16.6 (2012): 3891-3902.

IMPLEMENTATION OF TEST CONTROL IN THE STUDY OF TECHNICAL DISCIPLINES IN THE CONDITIONS OF ONLINE LEARNING ENVIRONMENT

Anisimov S., student of group M 2.4;

Mykolayiv National Agrarian University, Україна

Tutor: Doctor of Pedagogical Sciences, Associate Professor,

Professor of the Department of General Technical Disciplines

Стаття присвячена здійсненню тестового контролю при вивченні технічних дисциплін в умовах онлайн навчального середовища. Представлені три групи тестових питань: рефлексивні, графічні та гейміфіковані. Визначено, на розвиток яких вмінь спрямовані їх застосування під час подачі навчального контенту.

The article is devoted to the implementation of test control in the study of technical disciplines in the conditions of online learning environment. There are three groups of test questions: reflexive, graphic and