УДК 811.111

R. V. Bachynskyi

N. V. Herasymenko

DEVELOPMENT OF NEW ENERGY STORAGE TECHNOLOGIES TO PROVIDE UNINTERRUPTED ACCESS TO ELECTRICITY IN THE EVENT OF EMERGENCIES OR POWER OUTAGES.

Vinnytsia National Technical University

Анотація

Дослідження акцентує увагу на новій технології зберігання енергії для безперервного забезпечення електроенергією під час надзвичайних ситуацій. Воно досліджує методи, такі як батареї, паливні елементи, суперконденсатори та підтримку політики.

Ключові слова: технології зберігання енергії, безперебійний доступ до електроенергії, надзвичайні ситуації, перерви в електропостачанні, технології батарей, паливні елементи на водній основі, суперконденсатори, відновлювальні джерела енергії.

Abstract

This study highlights new energy storage tech for uninterrupted electricity during emergencies. It explores methods like batteries, fuel cells, supercapacitors, and policy support.

Keywords: Energy storage technologies, uninterrupted access to electricity, emergencies, power outages, battery technologies, hydrogen fuel cells, supercapacitors, renewable energy sources.

Introduction

This paper emphasizes the importance of uninterrupted access to electricity, especially during emergencies and power outages, and the need to develop new energy storage technologies to address this issue. The outdated power grid infrastructure and insufficient energy storage capacity in Ukraine lead to frequent power outages. The recent missile attacks of the Russian Federation on the Ukrainian energy infrastructure caused interruptions in the electricity supply, making this issue more relevant. The development of new energy storage technologies such as battery technologies, hydrogen fuel cells, supercapacitors, and integration of renewable energy sources can help provide uninterrupted access to electricity during emergencies and power outages [1, 2, 3].

Process

The development of new energy storage technologies requires a multidisciplinary approach involving researchers, engineers, and industry experts. The process involves several stages, including materials research, electrochemistry, system integration, testing, and deployment.

The first stage of the process involves materials research. Researchers are exploring new materials that can improve the performance, safety, and cost-effectiveness of energy storage systems. This includes the development of new electrode materials, electrolytes, and separators. Researchers are also investigating the use of abundant and low-cost materials, such as sodium and magnesium, to reduce the cost of energy storage systems.

The second stage of the process involves electrochemistry. Electrochemistry is a branch of chemistry that studies the interactions between electrons and ions in chemical reactions [1, 2, 4]. Researchers are studying the fundamental mechanisms of energy storage systems at the molecular level. This includes the study of charge transfer, ion transport, and electrochemical reactions in energy storage systems.

The third stage of the process involves system integration. Energy storage systems must be integrated into the power grid to provide uninterrupted access to electricity. Researchers are working to develop energy management systems that can optimize the use of energy storage systems and integrate them with renewable energy sources. This includes the development of smart grids that can communicate with energy storage systems to balance the supply and demand of electricity.

The fourth stage of the process involves testing. Energy storage systems must undergo rigorous testing to ensure their performance, reliability, and safety. Testing includes the evaluation of the performance of energy storage systems under different operating conditions, such as temperature and humidity. Testing also includes the evaluation of the safety of energy storage systems, such as their resistance to fire and explosion.

The fifth and final stage of the process involves deployment. Energy storage systems must be deployed in the field to provide uninterrupted access to electricity [1, 5]. Deployment includes the installation of energy storage systems in homes, businesses, and critical infrastructure. This also includes the development of standards and regulations for the installation and operation of energy storage systems.

Conclusion

In conclusion, the development of new energy storage technologies is crucial to provide uninterrupted access to electricity during emergencies and power outages [1, 2, 3]. Advancements in materials science, electrochemistry, and system integration are essential for the development of new energy storage technologies. Government incentives, regulations, and funding can promote the research and development of new technologies, and their adoption by consumers and businesses. Educating the public about the benefits of energy storage technologies and energy conservation can increase awareness and promote their adoption.

REFERENCES

1. Bandyopadhyay, S. and Mitra, S. (2014), "A review of energy storage technologies," Renewable and Sustainable Energy Reviews, vol. 33, pp. 532-545.
2. Chen, J., Zhang, X., and Liu, J. (2019), "Review of Electrochemical Energy Storage Technologies and Materials," China's Rare Earths, vol. 5, pp. 15-24.
3. Kim, J. S., Kim, S. G., and Lee, K. S. (2018), "Overview of hydrogen fuel cell system development and commercialization," International Journal of Precision Engineering and Manufacturing-Green Technology, vol. 5, pp. 461-472.
4. Pandey, A. and Srivastava, A. (2020), "Supercapacitors: materials, methods, and applications," Frontiers in Energy, vol. 14, pp. 423-441.
5. Thounthong, T., Fadel, M., and Davat, B. (2010), "Control strategies for renewable energy systems with storage: a comprehensive review," Renewable Energy, vol. 35, no. 12, pp. 2458-2472.

Бачинський Роман Валентинович – студент групи 1ЕС-22б, факультет електроенергетики та електромеханіки, Вінницький національний технічний університет, Вінниця, email: firesapfire@gmail.com

Науковий керівник: **Надія Валеріївна Герасименко** – викладач англійської мови кафедри іноземних мов Вінницького національного технічного університету.

Roman Valentynovych Bachynskyi - student of group 1EE-22b, faculty of Power Engineering and Electromechanics, Vinnytsia National Technical University,Vinnytsia, email: firesapfire@gmail.com

Supervisor: **Nadiia Valeriivna Herasymenko** - English teacher, Department of Foreign Languages, Vinnytsia National Technical University