

FIRE SAFETY IN THE ERA OF BLACKOUTS: RISKS OF USING GENERATORS AND GAS BURNERS IN APARTMENTS

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Abstract. The paper analyzes hazardous factors arising from the use of autonomous energy sources during prolonged power outages. The risks associated with gasoline generators and portable gas burners in apartments are examined, including carbon monoxide poisoning, fires, and explosions. Based on statistical data from international and Ukrainian organizations, the scale of fire and toxic hazards is assessed. Practical recommendations for reducing risks to human health and the environment are proposed.

Keywords: fire safety, blackout, generator, carbon monoxide, gas burner, household risk.

Анотація. У роботі проаналізовано небезпечні чинники, що виникають при використанні автономних джерел енергії в умовах тривалих відключень електропостачання. Розглянуто ризики застосування бензинових генераторів та портативних газових пальників у квартирах, зокрема небезпеку отруєння чадним газом, виникнення пожеж і вибухів. На основі статистичних даних міжнародних та українських організацій здійснено оцінку масштабів пожежної та токсичної небезпеки. Запропоновано практичні рекомендації щодо зниження рівня загроз для здоров'я населення та довкілля.

Ключові слова: пожежна безпека, блекаут, генератор, чадний газ, газовий пальник, побутові ризики.

Introduction. Due to the full-scale aggression against Ukraine and the resulting destabilization of the energy system, long power outages have become a daily reality for the population. This has forced citizens to massively implement autonomous solutions: from gasoline generators to tourist gas burners and other devices with open fire. Although such measures help maintain life in conditions of prolonged blackouts, they also significantly increase the level of danger in homes. According to statistics from the State Emergency Service, safety violations when working with heating and electrical equipment are currently one of the leading causes of fires in residential buildings [1]. Homemade or untested devices pose a particular danger [2].

The greatest hidden threat is the accumulation of carbon monoxide, which is released during fuel combustion in inappropriate conditions. According to the World Health Organization (WHO), carbon monoxide poisoning remains one of the most common causes of accidental deaths in the domestic environment [3]. Given this, the issue of safe operation of alternative energy sources in residential premises is critically important today.

Analysis of the state of the issue. Incomplete combustion of organic fuels leads to the release of carbon monoxide (CO), which, due to the lack of color, taste and smell,

is practically impossible to identify organoleptically [3]. It is these properties that make carbon monoxide one of the most insidious toxic products of combustion. Statistics from the Centers for Disease Control and Prevention demonstrate the scale of the problem: in the USA alone, more than 400 deaths and more than 14,000 hospitalizations due to accidental poisonings not directly caused by fires are recorded every year [4]. Experience shows that during prolonged energy crises and emergencies, the frequency of such incidents increases rapidly. According to reports from the National Fire Protection Association, it is precisely the violation of the rules for operating portable generators that becomes a key factor in mortality from carbon monoxide poisoning during periods of power outages [5].

In Ukrainian realities, during 2022–2024, the Ministry of Health and the State Emergency Service repeatedly recorded cases of injuries and deaths of citizens who installed generators directly in apartments or on balconies [1]. This situation indicates a critically low level of public awareness of the threats posed by the use of fuel devices in closed or semi-open spaces.

The purpose of the work is to analyze fire and toxic risks that arise when using generators and gas burners in residential premises during periods of prolonged power outages, as well as to formulate recommendations for their minimization.

Methods, materials and research results. The study is based on the analysis of statistical materials of international organizations (World Health Organization, Centers for Disease Control and Prevention, National Fire Protection Association), materials of the State Emergency Service of Ukraine on fire safety and the use of autonomous energy sources. The main methods of the study were the analysis of statistical data, comparative analysis of the risks of different types of autonomous power sources and generalization of fire safety requirements.

The analysis showed that the use of gasoline generators in closed or semi-closed rooms is particularly dangerous. In such conditions, combustion products can quickly accumulate, creating dangerous concentrations of carbon monoxide.

The main risks of using gasoline generators include:

- carbon monoxide poisoning;
- ignition due to overheating of the equipment;
- explosion of gasoline vapors;
- electric shock in case of improper connection.

A separate danger is the use of portable gas burners for cooking during power outages. The presence of an open flame near flammable materials significantly increases the risk of fire. The main risks of using such devices include:

- leakage of propane-butane mixture;
- explosion of gas cylinders;
- ignition of household items;
- formation of carbon monoxide due to insufficient ventilation of the room.

According to the State Emergency Service of Ukraine, a significant part of fires in the residential sector occurs precisely due to careless handling of open fire and violation of the rules for operating heating devices [1].

In addition to the direct threat to human health, the use of gasoline generators also has negative environmental consequences. According to the International Energy Agency, small gasoline generators are characterized by increased emissions of pollutants compared to centralized electricity generation systems [6]. They also create a significant level of noise, which worsens living conditions in apartment buildings.

Conclusions. The analysis shows that the use of generators and gas burners in residential premises during blackouts significantly increases the level of fire and toxic hazards. The most critical factor is the risk of carbon monoxide poisoning, which can lead to fatal consequences in a short time. Additional danger is created by explosions of gas cylinders and ignition of household items.

Risk reduction is possible provided that:

- use of generators only outdoors;
- installation of carbon monoxide detectors;
- compliance with fire safety rules;
- conducting webinars on the safe use of autonomous energy sources.

It is necessary to remember that heating a cylinder leads to the expansion of the gas inside it and, as a result, an explosion [7]. Therefore, it is important to store the gas container where it will not heat up – hide it from sunlight, do not install it near heating appliances and do not bring the cylinder from cold to warm.

Thus, the problem of fire safety during prolonged power outages is complex and requires a combination of technical, regulatory, and educational measures.

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