Physicians for Human Rights and Truth Hounds

Russian Attacks on Ukraine's Energy Infrastructure: Health Impacts Beyond Clinical Settings

Submission to the United Nations Independent International Commission of Inquiry on Ukraine

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1. Introduction

Russia's systematic attacks on Ukraine's energy infrastructure, targeting both power generation and distribution, have resulted in widespread scheduled and emergency power cuts affecting all oblasts to prevent nationwide grid collapse and to ensure adequate supply for critical services and infrastructure. These attacks and subsequent cuts have impacted the electricity, water,[1] and heating supply as well as means of communication[2] that are foundational to health care, the functioning of life-saving medical devices, and basic living conditions for millions of Ukrainians. This is particularly significant given Ukraine's climate, which can see high temperatures of 40 °C in summer and lows of -20 °C in winter, with all oblasts experiencing days below -10 °C between October and March.[3]

As national and international justice and accountability mechanisms investigate these attacks, a critical question emerges: what physical and mental health harm has been caused as a result of barriers to health care and other factors in the context of attacks against energy? The findings of this query are relevant to ongoing accountability proceedings on attacks on civilian infrastructure in Ukraine, including arrest warrants issued by the International Criminal Court (ICC) for causing "great suffering or serious injury to body or to mental or physical health."[4]

To address this question, this submission by Physicians for Human Rights (PHR)[5] and Truth Hounds[6] to the Independent International Commission of Inquiry on Ukraine examines how power outages impact the health of Ukrainians in non-clinical settings. This submission focuses on the impact of power outages on high-risk sentinel populations – these are specific vulnerable groups within the population, monitoring of which can warn of trends affecting the broader population.[7] The experiences of these particularly vulnerable populations can illuminate the reverberating consequences of these attacks.

The study maps emerging patterns of harm, identifies priority areas for future investigation, compiles expert opinions, and documents lived experiences of those affected, in the hopes of

informing further documentation and the development of strategies to provide remedies and reparations for harms. It also provides insights into emergent gaps in the collection of data and system responses.

By documenting these impacts, we aim to support the Commission in assessing the foreseeable health consequences of energy attacks and in identifying patterns of harm affecting sentinel populations. We hope this analysis will assist the Commission in evaluating the full scope of suffering caused by these attacks, identifying further areas for documentation, and formulating recommendations that respond to the needs of all affected populations.

2. Methodology

This research is a scoping study which explores and maps key concepts, trends, and data gaps in identifying how attacks on Ukraine's energy infrastructure cause health harms and disrupt continuity of care. The study focuses on groups that are foreseeably at higher risk of harm due to mobility limitations, dependence on continuous and electricity-dependent care (for example, ventilation), and heightened vulnerability to cold, heat, and stress.[8]

The groups considered in this study include older people (more than 60-years-old), people with disabilities, people requiring electricity-dependent care, and people with different health conditions. The time period analyzed is from the beginning of the full-scale invasion in February 2022 through December 2024.[9] Some interviews refer to more recent attacks and effects seen in 2025. Additionally, some data from before February 2022 is included as a baseline.

This study applies a mixed-methods approach to understand how power outages interact with disability, mobility limitations, pre-existing conditions, age, stress, and living conditions to produce compounded health risks for sentinel populations. Using semi-structured interviews, literature review, and publicly available health data, the research maps patterns and mechanisms of harm and identifies intersecting vulnerabilities that shape how different groups experience the reverberating effects of attacks on energy infrastructure.

Analytical Approach

Given the exploratory nature of the study and the variability and quality of available data, the analytical approach is based on a syndemic framework which examines how and why multiple, co-occurring stressors interact and reinforce one another, intensifying health risks and multiplying pathways to health harm.[10]

In this context, attacks on energy infrastructure causing power cuts would have multiple impacts on health and well-being of the sentinel groups due to co-occurring factors that compound one another. For example, living conditions, such as availability of heating or cooling during low winter and high summer temperatures, access to water, or reliance on elevators to enter and exit homes, interact with mobility limitations that prevent individuals from leaving their homes or reaching places where care is provided. These environmental and physical constraints combined with illness, disability, and chronic conditions increase vulnerability. At the same time, power cuts disrupt the continuity of care for conditions that require stable and regular access to care, such as dialysis, oncology treatments cycles as well as emergency response. Limited institutional capacity, whether due to staffing shortages, burnout, resource constraints, or inaccessible infrastructure, further contribute to negative health outcomes.

Together, these intersecting conditions create an environment in which the effects of outages multiply, producing health risks far greater than what would be seen in the presence of any single factor alone.

The study sought to identify the interacting mechanisms through which power outages produce heightened health vulnerability in Ukraine. Mechanisms include but are not restricted to device dependence, mobility restrictions, disruptions to treatment cycles, care delays, and environmental stressors. To further explore the potential multiplicity of ways in which health has been harmed by attacks on electricity, the study looks specifically at the case examples of elderly people and people dependent on dialysis.

Data Sources

The study draws on qualitative and quantitative sources of data.

Semi-structured interviews were carried out with witnesses, caregivers, support service providers, social workers, health care workers, and subject matter experts providing detailed accounts of experiences, challenges, and gaps in multiple systems' preparedness for electricity-related disruptions.

Datasets with various health data were requested from the National Health Service of Ukraine (NHS)[11] including indicators such as information about oncology treatments, dialysis sessions, diagnostic tools, hospitalizations. Qualitative and quantitative data was requested from the Ministry of Health, Ministry of Justice, and all oblast-level health departments[12] regarding cancelled procedures, interruptions to device-dependent care, mortality, and emergency care indicators. The responses to these requests were inconsistent, and the data provided could not be systematically analyzed but offered important insight into reporting practices and institutional gaps.

Interviews

The study team, consisting of experts from PHR and Truth Hounds, conducted sixteen interviews using a semi-structured guide tailored to different participant groups. Interview participants were selected using a purposive sampling strategy to capture both expert perspectives and lived experiences across sentinel populations. To understand how disruptions accumulate across different social, medical, and environmental vulnerabilities, the team sought to include at least one expert informant and one person with lived experience for each chosen group or topic. This approach allowed the study team to document both system-level patterns and concrete cases and mechanisms through which power outages disrupt care, daily functioning, and health management and produce health harms.

Participants were recruited across the following categories that are not mutually exclusive and often overlap (the number of participants listed under each category exceeds the total number of participants as a result of co-morbidities):

- Eight participants for disability and mobility-related topics: representatives of disability-rights organizations, inclusivity and accessibility experts, people who use wheelchairs or have mobility impairments, caregivers supporting individuals with chronic diseases or after a stroke or cardiac events, parents of children with disabilities.

- Four participants for electricity-dependent medical needs: patients using home medical devices or dependent on life-sustaining devices (e.g. patients undergoing dialysis), health care workers, palliative care providers.
- Four participants for elderly populations: experts working on social protection and providing social services, elderly people living with chronic diseases and residing in high-rise apartment buildings.
- Four participants for medical, mental health and psychosocial care: clinicians, psychologists, aid and social workers working with affected populations.

Interviewees were chosen through partner network referrals, based on previous documentation efforts, and following prior expert consultations. Participants were from different regions of Ukraine,[13] close to and far from the frontline, to illustrate specific pathways through which power cuts affect health, care continuity or daily functioning. Interviews continued until the team observed thematic saturation across the main impact domains.

Questions in the interview guide[14] explored reliance on medical devices, the effects of outages on home and clinical care, health harms, disruptions to treatment routines, changes in daily habits and mobility, mental health impacts, and perceived risks during blackouts.

Interviews were conducted in Ukrainian or Russian, remotely (eight) and in person (eight). Data from the semi-structured interviews was reviewed and analyzed using Dedoose, a qualitative data management and analysis software.[15] Transcripts were coded thematically to capture mechanisms that contribute to risk using a coding dictionary that was based on the research objectives as well as themes emerging from the data review.

Ethical Considerations

This study was approved by PHR's Ethical Review Board, and all data collection also followed Truth Hounds' Code of Ethical Conduct for Field Researchers.[16] Data was stored on a password-protected server accessible only to the research team.

Written informed consent was collected from each participant after reviewing the consent information with the interviewer. Identities of interviewees have been anonymized where requested to ensure their safety. Quotations were translated into English by a researcher fluent in Ukrainian and English once they were selected for inclusion.

Limitations

This scoping study has several methodological constraints: incomplete and inconsistent quantitative data, non-representative qualitative sampling, and lack of causal attribution.

Responses to requests for public information varied in quality, format, standard, and relevance. Most data holders did not collect outage-specific indicators. This made it impossible to systematically analyze the quantitative data received. The repercussions of the inconsistency of data are separately discussed in section 5.

Interviews provide rich insights but cannot capture the full breadth of harm to affected populations and were not intended to be representative. Conversely, the purposive sampling prioritized respondents who are more likely to experience harm.

The study identifies mechanisms and connections but does not establish causal attribution or produce population-level estimates of excess morbidity or mortality.

Despite these limitations, the study identifies critical ways through which energy disruptions undermine health and continuity of care for those particularly dependent on electricity and provides important insights into future domains of exploration.

3. Context: Russia's Attacks on Energy Infrastructure and Power Cuts in Ukraine

Attacks on Ukraine's energy infrastructure have been a feature of Russia's war in Ukraine since late 2022. Prior to the full-scale invasion, Ukraine generated enough energy through domestic production, supplemented with seasonal imports, to meet domestic demands and also regularly exported electricity.[17]

In the first year of the full-scale war, between October 2022 and February 2023, a wave of Russian strikes primarily targeted power distribution facilities.[18] These strikes, combined with the occupation of Ukrainian territory, resulted in the reported loss of 19 gigawatts of capacity.[19] As a result, in October 2022, power cuts were introduced for customers, with exceptions for critical infrastructure and energy importing facilities, lasting until mid-February 2023. These were predominantly round-the-clock power cuts, meaning that power was cut to rotating groups of customers on a scheduled basis.[20]

Strikes between March and August 2024 moved towards targeting power generation facilities themselves, including through 36 attacks on thermal power plants, combined heating power plants, hydroelectric plants, heating plants, and renewable energy facilities in 20 of the 24 government-controlled oblasts.[21] Following the spring attacks, Ukraine's power generation capacity reportedly declined to 12 gigawatts,[22] leading Ukrenergo, Ukraine's state-owned power company, to introduce load shedding[23] for businesses and industry in April, and hourly outage schedules for households in May.[24] According to data analyzed by Dixi Group, a Ukrainian think tank working in the field of energy and climate, power outages in Ukraine in 2024 totaled 1,951 hours, or one fifth of the year, 78 percent of which were in July.[25]

The attacks continued into 2025, with September and October 2025 being the months with the highest numbers of attacks on Ukrainian energy infrastructure since the full-scale invasion began.[26] Despite increased energy imports,[27] as well as ongoing efforts to restore capacity and increase the resilience of energy infrastructure,[28] unrelenting Russian attacks have already necessitated the reintroduction of scheduled and emergency power cuts across most regions of Ukraine from October 2025.[29]

Attacks on energy infrastructure are recurrent, leading to repeated air raids and disrupted nights. As these attacks often take place in populated areas, intercepted or misdirect strikes can hit residential buildings. In addition, energy workers and other first responders (firefighters, health care workers) have faced repeated strikes (often called "double tap") while responding to incidents.[30]

4. Affected Populations and Impacts

All of the effects described in this chapter are interconnected and mutually reinforcing. There is an overlap in groups that are affected: older people with limited mobility or chronic diseases, patients dependent on electrical devices who also live with disabilities, or dialysis patients who

cannot leave their homes. For them, attacks on energy infrastructure directly threaten life, health, and access to even the most basic care.

4.1. Disruption of Electricity-Dependent Medical Care and Continuity of Care

People living with chronic conditions that require continuous monitoring or life-sustaining technologies, both at home and in clinical settings, are acutely dependent on electricity. The interviews conducted by the research team show that particularly affected groups include people with renal failure, respiratory diseases, genetic and neuromuscular disorders, spinal cord injury, nervous system and cardiovascular diseases, and those with disabilities and/or limited mobility.

The electricity-dependent durable devices that keep these patients alive, stable, and provide relief are oxygen and related respiratory devices, infusion/intravenous and feeding equipment, mobility assistive equipment and others.[31] Among those mentioned in interviews are hemodialysis and peritoneal dialysis machines, ventilators, oxygen concentrators, infusion pumps (advanced medical devices enabling precise and secure administration of intravenous fluids, medications, and nutrients), anti-pressure ulcer mattresses and electrically adjustable beds, electric prostheses (artificial limbs controlled by the muscles of the residual limb and powered by a rechargeable battery), battery-powered wheelchairs, and accessibility devices like platform lifts. All of these devices rely on available and accessible electricity to function properly.

Impacts on Functioning of Life-Sustaining Devices and Technologies

Dialysis

People with end-stage renal failure, whose lives depend on regular hemodialysis and peritoneal dialysis are at high risk of serious health harms and death during power outages.[32] Dialysis is a medical treatment that removes waste products and excess fluid from the blood when kidneys are no longer able to do so. The procedure can be performed in a health care facility or at home.[33]

A nephrologist interviewed for this research who works at one of Ukraine's largest dialysis centers regularly servicing around 1,000 patients, explained the basic dependency of kidney patients on stable power supply: *"Dialysis is usually needed three times a week for four hours. For this you need electricity. Home dialysis has to be done every day – and that also requires electricity."*[34]

Estimates suggest that over 10 percent of the population worldwide has some form of chronic kidney disease, meaning several million people in Ukraine were at risk of advancing to end-stage renal failure during the war.[35] As of January 2021, over 11,000 patients in Ukraine were receiving kidney replacement therapy, including hemodialysis, hemodiafiltration, peritoneal dialysis.[36] When energy systems were attacked and power cuts became widespread, dialysis centers faced repeated interruptions in both electricity and water supply. For instance, in Khersonska Oblast, at least 12 dialysis sessions were reported as cancelled, interrupted or rescheduled due to power cuts during the last two months of 2022, which is likely an underestimate.[37]

For patients on dialysis, even short disruptions can be dangerous. The interviewed nephrologist described: *"The power cuts had a huge impact on our work. It was complete Armageddon —*

you can't tell patients to 'go home' because they depend on dialysis. […] In acute situations, deterioration can happen in just a few days."[38]

Extreme physical stress, mental distress increasing blood pressure and leading to other physiological responses, non-adherence to specialized diets, and interruptions in medical follow-up and treatment may all predispose patients to an accelerated decline of kidney function and increase the risk of short- and long-term complications.[39] The interviewed nephrologist underlined that *"power outages can lead to heart complications such as heart attacks, strokes, and sometimes even death. Cardiovascular problems often accompany kidney failure: high blood pressure, vascular damage."*[40]

When electricity is cut in the middle of a session, the situation becomes critical: "*If the power goes out during the procedure, the patient is connected to the machine with needles in their hands – this is a critical situation. We cannot wait too long – the blood in the system may clot. If there is no power for too long, we are forced to disconnect the patient. This results in the loss of about 200 ml of blood, which causes anemia.*[41] *Constant minimal blood loss is also harmful. Inflammatory processes and increased creatinine levels are also possible."*[42]

Home dialysis patients face other severe challenges. Their entire daily schedule must be organized around the procedure and the power-cut schedule. A peritoneal dialysis patient described how the first wave of power outages coincided with nightly automated dialysis sessions at home: *"You connect to the machine in the evening, it works all night, and it cannot be interrupted – that's how the system is programmed. When the first outages started at night, the machine began making strange sounds. I was terrified. My dad tried to connect it to some homemade batteries, but they were not enough."*[43]

That patient eventually switched to a manual dialysis method four times a day, requiring strictly sterile conditions, while still depending on electricity for lighting, water supply, and heat to keep dialysis fluids at the correct temperature. "*My water supply also depends on electricity. I need to have solutions at a certain temperature, and I need electricity to heat the water to prepare my solutions. Any power outage interferes with my dialysis. This is the most stressful procedure for me. There are certain rules, and any non-compliance can negatively affect my health."*[44]

This patient's life, travel, and any activities, including visits to hospitals, are planned entirely around the dialysis regime and the risk of the next outage: "*Whatever happens at home or in the country at this time, I have to go through [dialysis]."*[45]

The interviewed nephrologist noted that "*regarding the quality of life of people undergoing dialysis, it depends significantly on the stability of access to procedures. If there is a constant risk of power outages and it is unknown when interruptions will recur, this naturally worsens the quality of life.*"[46] If interruptions become regular, *"the kidneys do not work, and the person may die. […] If dialysis cannot be performed, it can end tragically."*[47]

Chronic and rare diseases

Other groups relying on electricity-dependent technologies include people with chronic and rare diseases,[48] such as amyotrophic lateral sclerosis (ALS), spinal muscular atrophy (SMA), Duchenne muscular dystrophy, and other neuromuscular conditions. These technologies

provide breathing and respiratory support, mobility and posture support, nutrition and swallowing support, monitoring equipment, and communication devices.

An organization supporting people with chronic and rare diseases and palliative diagnoses summarized the risks: *"If such a person is not fed, they will die. If they are not given water, they will die of dehydration. If a person is not turned over and massaged, their whole body will ache. These are the people who are most vulnerable and who are the first to be at risk when the power goes out. We have such a patient in Chernihiv who is still there. The patient is on a ventilator, and as soon as this device stops, the person will die […] We expect a high level of mortality among our patients precisely because of the lack of electricity."*[49]

Other Electricity-Dependent Equipment

Power outages can also impact cancer treatment as a whole. According to the largest network of cancer patients in Ukraine from all regions of the country, cancer treatments were also disrupted during power outages.[50]

Oxygen therapy and pumps delivering life-saving drugs (such as medications stabilizing life-threatening blood pressure and heart activity) depend on the same fragile power supply.[51] Lung cancer patients and those on palliative care using oxygen concentrators cannot leave their homes because they are tied to the devices, and "*there are practically no portable concentrators in Ukraine, only a few*" due to their high cost.[52]

Electricity-dependent equipment such as functional beds, anti-pressure ulcer mattresses, and suction devices also fail during outages, leaving patients stuck in unsafe positions, causing painful and sometimes impossible repositioning, and in some cases creating acute choking risks when suction stops.[53]

Impacts on the Continuity of Care

Interruptions in electricity also disrupt the continuity of care and access to services, especially for those who cannot easily leave their homes. Interviews with elderly and mobility-restricted respondents highlighted that repeated outages caused loss of access to scheduled medical care. People living in multi-story buildings depend on elevators to exit and re-enter. During scheduled short windows when electricity is available, some patients cannot risk leaving the apartment to access care because they may not be able to return if the elevator stops working. Limitations on mobility are described in more detail in section 4.3.

An organization supporting people with disabilities reported: *"Access to medical services was limited. Those who were unable to leave their apartments often could not receive them at all."*[54]

Care for chronic conditions in clinical settings is also jeopardized: a 66-year-old respondent from Kharkiv with multiple chronic diseases (hypertension, diabetes, cholecystitis, gastritis, previously had an ulcer, now has a hiatal hernia) was receiving intravenous therapy at a hospital when electricity went out.[55] An interviewee who is taking care of her husband after a stroke says that hospitals have improved their protocols during air raids and power outages, but *"before, we would come in and they would kick us out if there was no power."*[56] Another older respondent reported delayed ultrasound scans due to a power outage in the hospital.[57] More details on the impact of power cuts on the provision of health care are laid out in the report "Health Care in the Dark: The Impacts of Russian Attacks on Energy in Ukraine" by PHR and Truth Hounds.[58]

Logistics of patient evacuation and transportation, delivering equipment, medicines, and humanitarian support became more complex and resource intensive.[59] The interviewed nephrologist explained the challenges of delivering dialysis and transporting patients: "*There were periods when the situation worsened, for example, this month [October 2025], during the attack in the Pechersky district. At that time, there was no water in the city center for a whole day, and because of this, we could not perform dialysis. […] The whole day is spent on logistics: how to transport patients, especially those in wheelchairs. It's constant stress, and you're communicating with everyone at once — the clinic, the lab, the dispatchers.*"[60]

Continuation of essential care for cancer treatment has also been disrupted due to power cuts as "*patients canceled visits because they couldn't return home afterwards.*"[61] There have also been problems transporting patients to oncology centers during outages.[62] Furthermore, outages also reportedly led to spoilage of expensive targeted and immunological cancer medicines requiring storage in 2-8 °C, resulting in financial loss and treatment delays.[63]

Impact on Emergency Services

Emergency services are affected by the lack of mobile connection and dangerous traffic patterns during power cuts. A health care worker overseeing five emergency medical service centers in Sumska Oblast noted that "*due to power outages caused by Russian Armed Forces attacks on energy infrastructure, particularly during calls from residents of apartment buildings, there is a problem with staff access to patients, delivery of equipment to patients, conducting a quality examination of patients on site, transporting patients to ambulances, and there are also problems with violations of protocols for providing specialized consultations for certain types of diseases due to the lack of communication. This also worsens the quality and accessibility of medical services for the population. This creates particular problems during emergency hospitalization (cases of CPR [cardiopulmonary resuscitation], clinical death, etc.). The lack of electricity also causes problems with the movement of teams across communities/cities*."[64]

Telemedicine Disruptions

Telemedicine and e-prescription systems are similarly vulnerable. When power and communications go down, physicians cannot issue electronic prescriptions. This can delay necessary care, for example, for fulfilling prescriptions for reimbursable opioid analgesics for patients in severe pain.[65] Interviews underscored that older adults were unable to use telemedicine, electronic booking, or prescriptions when power and mobile networks were down, leaving them with no alternative pathway to medical advice or prescriptions. An elderly respondent said that her treatment was complicated by power cuts: *"They admitted me [to the hospital] but couldn't prescribe me any medication because the "Helsi" system [a medical information system] wasn't working. And I need to take medication for high blood pressure every day."*[66]

Impact on Service Providers and Outpatient care

Service providers themselves are also affected. For example, the offices of an organization supporting people with disabilities, whose team also uses wheelchairs, were located on higher floors and became inaccessible to staff and people they support when lifts stopped working, forcing them to suspend or limit their scope of work.[67]

One mother of a child with a mental disability described how their kindergarten for children with special education needs is not part of the government-designated critical infrastructure list and is thus subject to constant power cuts without a backup power generator.[68]

This mother underlined the importance of predictability of their schedule for her child's well-being. Any interruption to their plans may cause substantial distress to the child, and power cuts make it difficult to plan. She says: "*We were at the center for children and electricity went off. It's one thing when it's a typical child who can accept it normally. But I can never predict how my child will react to such a situation. Yesterday, he got scared and screamed.*"[69]

4.2 Breakdown of Essential Living Conditions

Power cuts affect water supply as electric-powered pumps stop operating.[70] Heating is also impacted, as municipalities provide centralized heating by filling pipes with hot water.[71]

Interviewees attested to water outages lasting as long as several days, but even shorter outages can seriously impact the health and quality of life of sentinel groups.

A Kharkiv resident emphasized the wider ramifications of this problem: "*Many people on the ninth floor sold their apartments and moved out because of the constant power cuts*."[72] Residents who were elderly or have mobility issues were not able to get down to fetch water. One interviewee shared that, "*it is physically impossible to reach the water distribution points*."[73] A representative of an organization supporting people with disabilities reported that a third of their surveyed clients cited water supply as a main problem associated with power cuts.[74] According to an architect who specializes in inclusivity, accessibility, and adaptations for people with disabilities, the situation is even worse in villages than in cities: "*There is a problem with water in wells - it is disappearing. This is very difficult. We need organizations to deliver water*."[75]

Personal Hygiene

Disrupted water supply makes it difficult to maintain hygiene, which makes the situation for people with disabilities and others who might not have alternatives more severe. For instance, a psychologist described that a patient of theirs who lives on the eighth floor of a building and who has cancer has limited mobility and sometimes *"is unable to use water or carry out hygiene procedures."*[76]

The inability to maintain good hygiene can further exacerbate health problems. An interviewed person with a disability developed kidney and bladder problems under Russian occupation, due to power outages and low temperatures which made it impossible to bathe.[77] Caretakers of children with disabilities also reported difficulties in maintaining hygiene: "*They cannot get warm water to bathe their children, or if the child spends most of their time lying down and has an anti-pressure ulcer mattress, they have to wash things frequently*."[78]

Temperature Regulation

Heating outages can even outlast power cuts; if the power is cut and water in the pipes freezes, the pipes can burst and must be repaired before returning to use. A lack of heating has grave consequences for individuals whose health conditions affect their temperature regulation.

An interviewee with a musculoskeletal disability highlighted the direct impact low temperatures have on her condition: *"Spasticity [abnormal muscle tightness] depends on temperature and always increases when it is cold. […] So, if there is no electricity, there is no heating, and spasticity increases".*[79] For this interviewee, cold-induced muscular spasticity further decreases her mobility: "*You simply cannot bend your legs, and you have to do that when you go downstairs. And if you do it forcefully, it causes painful discomfort."*[80]

Individuals with spinal cord conditions are also particularly vulnerable to the harmful effects associated with a lack of warm water for temperature regulation, as one such interviewee noted: "*People with spinal cord injuries have many hygiene-related needs. These include access to hot and cold water and heat. My injury causes thermoregulation problems, so I get cold very quickly, and in summer, on the contrary, I overheat very quickly. This significantly affects how I feel. For example, if I am cold, I cannot work; my brain does not function, it only thinks about how to warm up, and this affects my productivity. The ability to take a shower and all these nuances are very important*."[81]

In some areas, authorities have set up "heating points," where generators make it possible for people to warm up, recharge devices and get help, such as first aid. However, people with limited mobility are not necessarily able to access them. Moreover, as an interviewee from Kharkiv caring for her husband after a stroke noted in relation to a heating outage of almost three days in the winter of 2022-2023, "*The heating points did not help, because there were huge numbers of people and they could not cope."*[82]

Food Storage and Eating Habits

Power cuts additionally have significant impacts on eating habits and the ability to prepare and store food, leading to inadequate nutrition further exacerbating poor health among vulnerable populations. As one interviewee noted, *"if someone has a boiler, if they have an electric stove, they cannot cook food, food in the refrigerator spoils, and so on. For vulnerable groups of the population, this is an even greater challenge*."[83] A Kharkiv resident also spoke about this: "*Food spoiled during the power cuts. We sold our freezer because it's difficult to use in our city with constant power cuts. It's better for us to preserve [canned] food — it just sits in the pantry. We're afraid to keep anything that needs electricity. We had to throw a lot of things away."*[84]

An interviewee from a social services center in Kyiv said that the effect of power outages on refrigerators is *"a problem."*[85] In particular, this places additional strain on caregivers and care services, who have to make more frequent visits in order to ensure persons with limited mobility have access to fresh food: "*We visited people more often to bring them fresh food. So, employees did not make big purchases, but smaller ones and visited more often, bringing fresh food. We delivered dairy products and meat every day."*[86] Moreover, the same interviewee noted that it is harder to provide warm food to individuals if they have electric stoves. The parent of a child with a disability living in an apartment with all-electric appliances further highlighted the strain caused by power cuts to ensure that her child's specific food needs are met: "*Sometimes I have had to wake up at night while there was electricity to catch the interval of power and cook for my little child."*[87]

An at-home dialysis patient described the difficulty of maintaining the necessary healthy diet for her condition during a power cut: "*Before dialysis, I need to eat well. Again, everything depends on electricity, because to prepare food, I need electricity at least in the kitchen."*[88]

4.3. Limited Mobility and Building Access

Power outages resulting from attacks on energy infrastructure create mobility barriers for many population groups. The definition of people with reduced mobility encompasses all who face movement limitations for various reasons, including those for whom this limitation is temporary. This expanded understanding is reflected, for instance, in the European Commission's definition, which includes not only wheelchair and assistive device users, but also pregnant people, elderly people, parents with strollers, and individuals with temporary injuries.[89] These categories are dynamic, and under certain circumstances almost anyone can experience reduced mobility.

For individuals with chronic conditions affecting the musculoskeletal system, mobility limitations are a constant in their daily life. This includes wheelchair, walker, and crutch users, people with cerebral palsy, stroke survivors, those with neurodegenerative diseases, and others requiring assistive devices for movement.[90] Power outages further restrict mobility through the discharge of electric wheelchair and scooter batteries[91] without the ability to recharge and through exacerbation of spasticity due to lack of heating.[92] Elderly people are also impacted, as age-related changes (decreased muscle strength, balance problems, arthritis) gradually create progressive difficulties in movement.

The conflict has also increased the number of patients with complex multiple injuries. The number of veterans with spinal cord injuries, limb amputations, loss of vision or hearing, as well as their combinations, is growing, creating diverse functional limitations requiring individualized approaches to ensuring mobility.[93]

Most interviewees also reported security concerns during air raids as it was difficult for them to reach shelters during power cuts. For people dependent on electrical medical devices, it is already difficult to leave the apartment, and according to the organization working with cancer patients, during an air raid, *"when there is no electricity, everything becomes more difficult, of course."*[94] The organization working with people with disabilities noted that their clients had difficulty reaching shelters during power cuts due to non-functioning elevators. They also added that without electricity, air raid alerts might not be triggered, and "*people are not even aware that there is danger; they only hear the explosions*."[95] Another interviewee who is working with palliative patients, says: "*Usually, it is impossible to disconnect a person from the machines and move them to a shelter. In some cases, this can lead to death."*[96]

Critical Dependence on Elevators

As of 2022, 48.8 percent of households in Ukraine lived in apartment buildings, including communal apartments and hostels.[97] Non-functioning elevators in apartment buildings create another barrier for people with reduced mobility. For wheelchair users, dependence on elevators is absolute, making access to housing on upper floors physically impossible without power. For individuals with limited endurance or chronic pain, even a few floors of stairs can constitute an insurmountable barrier, especially when repeated climbs throughout the day are necessary. The absence of a functioning elevator creates a situation of forced isolation or loss of access to housing.

A representative of an organization supporting people with disabilities confirms a systematic pattern of mobility restrictions in apartment buildings among their surveyed clients. Their clients who use wheelchairs or other assistive mobility devices described feelings of being *"prisoners"* in their own homes, with some reporting not being able to leave home for up to several weeks.[98] Such prolonged isolation means not only social exclusion but also restricted access to basic resources such as food, medical services, and medication. Financial constraints, especially during wartime and outside the capital, make backup power inaccessible for most people.[99]

Unplanned outages present particular difficulties when a person with mobility limitations finds themselves outside their residence. The organization supporting people with disabilities described their clients having to wait under building entrances for six to eight hours until power was restored allowing them to access their homes.[100] Even with the physical ability to descend, the question remains whether one can ascend back.[101] Respondents shared various strategies they use for addressing this problem—engaging neighbors, calling emergency services, asking other parents to pick up children from school, or waiting for hours under building entrances.[102]

Geographic Divides

People with reduced mobility have fundamentally different experiences of power outages based on their housing type. According to an expert in inclusivity, accessibility, and adaptations for people with disabilities, people who live in houses rather than apartments often retain the ability to leave their residences and access nearby facilities, while apartment building residents face prolonged waiting to accomplish basic movements.[103]

In large cities, establishments operate on generators, heating points exist, and food and water delivery services are available, although even there delivery is often limited to the fifth floor due to elevator outages.[104] Although generators are easier to install in private housing, small settlements lack such infrastructure to support generators, making residents of villages and peripheral areas particularly dependent on power restoration to maintain mobility and have access to food and medicine supply.[105]

Cascading Consequences of Mobility Loss

The inability to leave one's residence combined with restricted access to food, water, and heat, creates multiple overlapping health risks.[106] Mobility restrictions during power outages trigger a chain of secondary health risks for people with reduced mobility. For individuals with chronic conditions requiring regular medical monitoring, such loss of access can lead to primary condition exacerbation as seen in previous sections.[107]

Prolonged isolation at home, as previously seen during the Covid-19 pandemic,[108] creates psychological burden, intensified by uncertainty about outage duration. For individuals living independently, anxiety intensifies due to inability to seek help.[109] Meanwhile, social isolation limits support from informal networks that often compensate for formal service deficiencies.

4.4 Mental Health and Psychosocial Harms

Another aspect of health profoundly impacted by power outages is mental health. A WHO April 2025 survey found that 72 percent of the adult population of Ukraine had experienced mental health challenges in the previous 12 months, while 16 percent of households had members who were "too upset or anxious to carry out their normal daily activities."[110]

Studies have found a statistically significant link between continuity of electricity and anxiety and depression levels in conflict-affected areas.[111] REACH Initiative, humanitarian initiative providing analysis from contexts of crisis, disaster and displacement, additionally reported in March 2025 that the "unpredictability of power supply, combined with the stressors of living in conflict zones, contributes to heightened levels of anxiety and depression among affected populations."[112]

Interviews conducted for this study indicate widespread psychological distress across the sentinel populations in relation to power cuts, with an interviewed psychologist working with affected populations emphasizing that "*attacks on energy have a colossal impact on psychological health.*"[113] Notably, interviewees report power outages contributing not only to increasing anxiety levels and the worsening of mental health conditions, but also the exacerbation of pre-existing physical conditions, and the development of new conditions.

Even for individuals without pre-existing mental health conditions, common manifestations of stress resulting from power outages include a decline in productivity and general wellbeing, and feelings of helplessness.[114] According to the psychologist, power outages also contribute to an "*intensification of depressive states and traumatization.*"[115] Moreover, as the psychologist noted, it can become more difficult to cope the longer the situation persists: "*People are faced with the fact that such long-term things become harder for them to endure.*"[116]

Impact on Individuals with Pre-existing Mental and Medical Conditions

Individuals with pre-existing mental health conditions are particularly impacted by the stress caused by power cuts. According to a psychologist working in Chernihivska Oblast interviewed for this study, attacks on energy directly contribute to the worsening of some patients' conditions. For instance, patients are forced to postpone appointments with mental health specialists because there is no power or public transport is not working due to a power cut. While they speak with them over the phone when possible, during power cuts mobile phone coverage is also affected.[117] Given power cuts' impact on communication and appointments with patients, their mental health conditions worsen as a result: *"there is nothing to lean on, no support that should help a person recover, they begin faltering."*[118]

The strain on mental health induced by power outages can also contribute to the exacerbation of pre-existing medical conditions. In particular, since stress raises blood pressure, stress caused by power cuts is particularly dangerous for individuals who already have high blood pressure. As a nephrologist interviewed for this study highlighted, elevated blood pressures can ultimately lead to heart attacks or strokes in older people and accelerate kidney damage.[119]

Impact on Individuals Dependent on Electrical Medical Devices

High levels of anxiety among patients dependent on electrical medical devices can trigger panic attacks, contributing to morbidities. As a representative of a foundation supporting individuals receiving palliative treatment noted: *"Many people start to have panic attacks. This in itself*

triggers a series of breathing problems and is a state that is difficult to get out of. That is, a person may need a small dose of oxygen, and when disconnected for 5-6 hours, it is difficult, but they can hold on. But if a person has a panic attack, their chances decrease significantly because they are suffocating not so much from the fact that they're suffocating, but from the fear that they will suffocate."[120]

Persons receiving at-home dialysis treatment report finding power outages "emotionally difficult": "*When there is power, when the procedure goes according to schedule, it is much easier to endure. And then there's my hormonal balance in relation to my kidneys, my adrenal glands, the hormone cortisol, which rises with any anxiety. […] I absolutely cannot tolerate any stress. When there is no electricity, when something happens that is not on schedule, plus there are [negative] events in the country, and we have had negative events in our city, explosions, drones. […] So, this affects me a lot."*[121] High cortisol levels are associated with increased risk of mortality among chronic kidney diseases patients.[122]

Impact of Isolation

Individuals with disabilities, limited mobility, or living alone also experience heightened anxiety surrounding isolation in the context of power cuts. The psychologist says: "*There is a risk of isolation because there is no light, no communication, and it is unclear what has happened to family and loved ones. It is a zone of anxiety and turbulence.*"[123]

People trapped in their apartments in high-rise buildings can have difficulties getting help, according to the psychologist, as *"it is not so easy to go up those steps to visit the patient."*[124] Moreover, a cumulative effect can be witnessed: the psychologist noted that people who are confined to their homes because of limited mobility and lifts being unusable will often gain weight and "*are scared that medical workers will not be able to cope with it to transport them to hospital.*"[125]

The risk of isolation stemming from power outages further impacts mental wellbeing by disrupting routine and sense of time. For the sentinel groups, according to the psychologist, "*there is also nothing to rely on which can somehow build a routine. Routine, which should stabilize a person, especially [a person] with mental health conditions, is disrupted. Because when there is no power, they go to sleep. Sleep disturbance begins, because they sometimes sleep during the day, they wake up at night. I have even had this happen with a patient, where he doesn't understand what season it is, he starts to get confused. Such things can lead to the manifestation of mental disorders, and an intensification [of symptoms] is observed."*[126]

Impact of Deterioration of Living Conditions

The inability to access basic hygiene places an additional strain on mental wellbeing. Since water and wastewater are also cut off for many people in the event of power cuts, it becomes impossible to use toilets. At the same time, according to the interviewed psychologist, stress causes many people to need to relieve themselves more often, only compounding the stress of power outages: "*A basic need is cut off. So, with the background of anxiety everything gets worse."*[127]

Another cause of anxiety is the impossibility of keeping food and medications, such as insulin, at appropriate temperatures. According to the interviewed psychologist, these additional concerns can lead to clinical symptoms: "*Where to put food, whether it will spoil or not. In general, when*

will the lights come back on? These are all problems that cause people to experience anxiety. They are already vulnerable, and this vulnerability increases helplessness. Helplessness can lead to the worsening of a depressive state. I often see people getting depressed."[128]

Impact on Caregivers and Adaptation Strategies

Caregivers and parents also noted higher levels of their own distress as well as in people under their care, particularly children with disabilities.[129] In some cases, power cuts cause such distress that children can only be calmed through administering additional medication.[130] For one such parent, the lack of a functioning lift in the family's apartment building meant *"being constantly in a state of added stress."*[131] She noted that because of this, she was "*unable to get pregnant, as I am afraid that I will have to carry a large child with me and this will cause problems*."[132]

The psychologist also highlighted that adaptations that their patients are forced to make due to power outages can have their own cascade of negative consequences. In particular, many of their patients – approximately one third – have gone to live in other regions or countries since 2022, which reflects a general documented trend where reports show that attacks on energy fueled an increase in departures from Ukraine.[133] Their elderly patient had to move in with their child due to power cuts, contributing to isolation from the usual community. As a result, such individuals struggle with *"[a]n increased sense of helplessness, the meaninglessness of existence,*" and "*increased thoughts of 'Is it worth living?'.*"[134]

According to the psychologist, using generators, another common adaptation to power cuts, can further impact individuals with mental health conditions due to the noise, such as those with post-traumatic stress disorder (PTSD) or those who have lived through Russian occupation.[135] The loud noise produced by generators during power cuts can cause extreme stress to children, due to the association with the loud noise of explosive weapons (i.e. drones, missiles), in particular when the child has lived through Russian occupation or a siege.[136]

The constant fear that the next outage may be fatal for those dependent on power to keep them alive has a profound mental health impact on patients and families. As one respondent working with palliative patients summarized: *"A person who understands that they might die if the lights go out cannot be in a normal state. And a family who knows they are walking on the edge cannot be in a normal state either."*[137]

4.5. Coping Strategies

Coping strategies have largely been individualized and dependent on available resources. NGOs and health care workers described constantly searching for backup options. As one organization working with people with disabilities put it: "*It is also a financial burden: the cost of alternative power sources, non-perishable food, or replacing food that has gone bad. These are additional expenses, and as a result, you cannot work and earn a normal income, and the situation as a whole encourages you to spend more.*"[138]

Under the circumstances of constant power cuts, service providers like hospitals are more likely to introduce adaptation mechanisms that are not dependent on electricity: *"Generators are not eternal and have a limited lifespan. Therefore, they [a hospital providing rehabilitation services] are switching to simple exercise machines, rehabilitation methods, and equipment that does not require power."*[139] Although older equipment that does not depend on electricity is

an alternative, it may be largely unavailable and unfamiliar to staff, meaning facilities would need to diminish their standards of care.[140]

Individuals who are unable to leave their residences in the case of a power cut become reliant on family members, neighbors, or volunteers to bring them essential supplies, such as food and water. According to the interviewed psychologist, simply having a plan for blackouts *"alleviates the feeling of helplessness,"* and if patients work out a way to know about a planned blackout in advance, *"it is viewed totally differently."*[141]

Economic capacity determines access to alternative solutions. Respondents noted that purchasing generators or uninterruptible power systems (typically costing approximately 1,000 USD) is financially inaccessible for many.[142] Similarly, regular use of delivery services or specialized taxis requires additional financial resources. Thus, economic status becomes a factor determining the degree of isolation during power outages: those with sufficient funds can maintain some autonomy of movement, while economically vulnerable groups remain entirely dependent on power restoration.

4.6. Syndemic Effects and Compounding Risks

The preceding sections of this study have presented specific consequences of systematic attacks on energy infrastructure for various vulnerable groups. Loss of mobility due to non-functioning elevators, disruption of medical devices, complications in dialysis procedures, lack of access to basic care and hygiene, and mental health impacts have all been examined separately. However, the data collected consistently indicates that these consequences do not exist in isolation. They interact, overlap, and mutually reinforce one another, creating more complex patterns of vulnerability than the individual factors alone.

Medical anthropology describes such situations through the concept of syndemics: cases where multiple diseases and risk factors biologically and socially reinforce one another in the context of structural inequalities.[143] This perspective allows us to understand why, with equal exposure to power outages, different population groups demonstrate different levels of vulnerability. The differences are determined not only by individual medical diagnoses but also by the layering of economic deprivation, architectural barriers, social isolation, limited access to information, and historical inequalities in access to resources. Understanding the intersecting and overlapping nature of the impact of power outages is critical for developing adequate responses. Interventions aimed at mitigating only one risk factor might be insufficient if they do not account for the mutual reinforcement of multiple vulnerabilities.

Cascading Effects: Mechanisms of Mutual Reinforcement

Accounts from respondents illustrate how power outages can trigger cascades of interconnected consequences. A typical scenario unfolds as follows: loss of power puts elevators out of service, making it difficult and often impossible for people with limited mobility to leave their homes and access care. At the same time, loss of means of communication deprives them of the ability to contact relatives promptly or make medical appointments online.[144] Lack of sanitation and the inability to access back-up power due to socioeconomic inequalities further contribute to negative outcomes.

An organization supporting people with disabilities indicated that their clients reported being unable to receive scheduled medical care because the visit took longer than the window between scheduled outages.[145] Other clients of theirs reported that in an event of a hypoglycemic coma their caregivers could not call an ambulance because of the disruption of mobile service during power cuts.

Interviews demonstrate that vulnerability has a cumulative character: each additional risk factor increases overall vulnerability not linearly but exponentially.

Older Adults as a Syndemic Case

The case of older adults illustrates a key characteristic of the syndemic impact: vulnerability to power outages is determined not by one specific diagnosis but by the cumulative burden of multiple interacting factors. Older adults often do not have a single critical condition that would explain their vulnerability. Instead, their situation is characterized by polyvictimization – the simultaneous presence of several chronic conditions, each requiring regular monitoring, but which collectively create a different, cumulative, and heightened vulnerability.[146]

A 66-year-old respondent described a constellation of chronic conditions often seen in older age: "*I have elevated blood sugar... type 2 diabetes... Poor lipid profile, high cholesterol. I take statins out of fear of a stroke or heart attack. I have early-stage cataracts... [...] Blood pressure – that's accompanying all of this*".[147] The postponement of a scheduled ultrasound at the state polyclinic due power cuts was combined with sleep disturbances from nighttime air raid alerts, which led to increased blood pressure.[148] Each of these factors might be manageable separately, but their simultaneous presence creates a compounding situation where managing one condition becomes impossible without addressing the others.

The economic vulnerability of older adults in the context of full-scale war adds a critical dimension. Pension levels are often insufficient to fully address or at least partially mitigate the impacts through purchasing generators or uninterruptible power systems, or relocating to housing with better conditions. Even basic adaptations, such as voltage stabilizers to protect refrigerators, require financial resources unavailable to a significant portion of older adults.

Age-related changes in mobility create additional vulnerability. Climbing stairs to upper floors becomes physically exhausting, limiting the frequency of leaving home. A social worker providing services to the elderly describes outages during the first waves of attacks: *"When the lights went out, people stopped going outside because they were afraid of getting stuck in the elevator."*[149] The combination of elevator outages and the need for regular monitoring of chronic conditions creates a situation where each departure from home requires significant physical effort, and missed doctor visits can lead to deterioration of health status.

The digital divide adds another layer of vulnerability. Access to information about outage schedules, heating points, and the ability to make medical appointments online require digital skills that many older adults lack.[150] The digitalization of services, intended to facilitate access, can create additional barriers for older adults, especially during power outages when charging a phone or obtaining an internet connection becomes problematic.

Social isolation, common among older adults, particularly during wartime when children and grandchildren may reside in other regions or abroad, means limited opportunities to receive assistance during outages. A respondent described being isolated: *"I live alone, and when the power goes out, I start to worry about what to do. My blood pressure rises—it can be 200 over 105. I feel very unwell, and I immediately become anxious: what should I do if the power is out for a long time?"*.[151] This anxiety, combined with sleep disturbances from nighttime alerts and stress from outages, creates a burden that increases physiological vulnerability to the exacerbation of chronic conditions.

Dialysis as a Syndemic Case

The case of dialysis patients illustrates another example of syndemic vulnerability, where health risks arise not only from kidney failure itself but from the interaction of medical device dependency, possible disability, psychological stress, living conditions, economic constraints, and other environmental factors.

Patients undergoing hemodialysis and peritoneal dialysis rely on uninterrupted electricity for treatment devices, water, heating of fluids, lighting required for sterile procedures, and basic household functions. For continuous dialysis, a centralized water supply is critical*: "If the pressure in the system is weak, it is not enough; the flow must be stable. […] If there is no electricity, water does not reach the upper floors, and this creates difficulties."*[152]

Dialysis patients may also live with co-occurring disabilities or mobility impairments, meaning power cuts do not just disrupt treatment but also limit their mobility. The interviewed nephrologist emphasized this interaction: "*The hardest part is for patients undergoing home dialysis. Many of them have disabilities, some use wheelchairs or walkers. If the power goes out, they cannot even leave their apartments."*[153]

Psychological stress is another reinforcing factor. Fear of missing a session, device stopping mid-procedure, and the mental load of planning every aspect of life around outage schedules may in turn exacerbate the primary condition. Economic constraints further compound vulnerability as living with a disability or a chronic condition is a financial burden on its own, but during power outages, additional resources are needed for backup power and other adaptation mechanisms.

5. Policy and Data Gaps

Understanding the full impact of attacks on energy on health and continuity of care is constrained by structural gaps in data collection and reporting. The research team sought to obtain official information from central and regional authorities through public information requests and accessed open data from different agencies. The responses to requests and data that were provided revealed inconsistent reporting, incomplete datasets, and lack of collected data, which together makes systematic analysis and consequently documentation of the reverberating impacts of attacks on energy extremely difficult to analyze quantitatively.

The Ministry of Health, the National Health Service, and regional health departments do not collect or maintain standardized indicators that would allow tracking how power outages affect

the provision of medical services both in clinical settings and outside of formal health care. Metrics that could indicate indirect impacts, such as number of cancelled or interrupted procedures, disruption to dialysis or oxygen-dependent care, or outages affecting diagnostic capacity, are not captured in a consistent manner. As a result, the information provided varied widely between regions, with some offering partial quantitative data, others supplying narrative descriptions, and most reporting that no such data was collected.

Even when data existed, it was often fragmented, incomparable across oblasts, and has suffered from internal discrepancies. Facilities used different timeframes, definitions, and units of measurement. Some reported figures contradicted earlier submissions or could not be reconciled with other datasets where these data sets should be comparable. This inconsistency reflects the absence of a unified reporting framework for energy-related health disruptions and highlights the burden placed on individual facilities to improvise their own systems to track data within an active conflict.

Some authorities explicitly noted that they do not monitor the health impacts of energy disruption as a separate category. Power-related interruptions were sometimes mentioned only as part of broader operational challenges, without distinguishing between those caused by hostilities, scheduled or emergency outages, or technical failures. Most regions also did not collect data in a way that could be disaggregated by age, gender, causes of hospitalizations, or morbidities. This lack of disaggregation makes observing patterns difficult. For example, which procedures are most often disrupted, which populations are disproportionately affected, or how outages compound vulnerabilities.

Most importantly, these gaps do not allow the central government and regional authorities to form adequate resilience strategies and create operational plans that are rooted in the needs of service providers and patients. The absence of reliable information stands in contrast to the scale of the problem observed in interviews, where disruptions to dialysis, ventilation, mobility, provision of care, and rehabilitation emerged prominently.

6. Legal Analysis

This section highlights potential legal pathways through which the harms documented in this submission, particularly those affecting electricity-dependent and other high-risk civilian populations, may be examined by the Commission under international humanitarian law (IHL), international human rights law (IHRL), and international criminal law (ICL). The following is a non-exhaustive list of international legal violations implicated by the findings of this submission, presented with the understanding that extreme harm to vulnerable health groups is only one aspect of the violations analysed. A more detailed analysis of the legal framework pertaining to attacks on energy and their impacts on health care is presented in the report "Health Care in the Dark" by PHR and Truth Hounds.[154]

The Commission has previously noted that "frequent blackouts caused by massive waves of attacks by the Russian Federation against the energy-related infrastructure of Ukraine have curtailed aspects of the enjoyment of the rights to health and to education, particularly for certain categories of persons."[155] The accounts presented in this submission further illustrate concrete and particularized manifestations of harm caused by attacks against energy, including

severe physical and mental suffering and disruption of life-sustaining medical care among civilians that depend on electricity for their everyday health, older persons, and people with disabilities.

The documented impacts include interruptions of dialysis, ventilation, oxygen therapy, oncology treatment cycles, and access to water, heating, sanitation, and mobility. For affected individuals, these impacts were not temporary inconveniences but resulted in serious injury to physical and mental health, potential worsening of pre-existing conditions, and marked deterioration of living conditions. These impacts warrant further documentation and investigation to understand the full scope of harm.

Legal experts agree that civilian harm extends beyond immediate physical injury encompassing cumulative, indirect, and reverberating effects,[156] and that what constitues suffering to civilians must take into account individual vulnerabilities.[157] This research demonstrates that secondary and tertiary harms resulting from attacks have a visceral impact that may threaten life and health, in particular among vulnerable populations.

Based on the impacts described in section 4, the Commission may wish to consider the following areas of legal relevance:

Indiscriminate Attacks

Parties to a conflict must "at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives."[158] Attacks that fail to distinguish between civilian military targets are indiscriminate.[159] In assessing compliance with this principle, the Commission may consider not only the immediate kinetic impacts of attacks, but also effects of an attack that resemble kinetic impact.[160]

The Commission may determine attacks on energy infrastructure failed to distinguish between civilian and military objects, or in fact targeted civilian objects.[161] In addition, as documented in this submission, outages caused by attacks on energy infrastructure produced immediate civilian harm in non-clinical settings, including among at-home dialysis patients, ventilator users, older people, and people with disabilities. Considering that these effects resemble those of a kinetic impact, the Commission may factor these harms to civilians into determination of the indiscriminate nature of attack and/or determine that these attacks demonstrate disregard for human life in violation of the underpinning principle of humanity.[162]

Disproportionate Attacks

Even when targeting a military objective, a combatant may not launch "an attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated."[163] Harm to civilians may include "indirect and reverberating effects…insofar as they are reasonably foreseeable in the circumstances."[164] These indirect and reverberating effects may include "interruptions of electricity, gas, heating and water supplies … including their impact on the health system."[165] Moreover, the Commission may consider that

the “cumulative effect” of both direct and indirect harm "will influence the incidental-harm assessment and analysis during protracted hostilities.”[166]

The indirect and reverberating harms documented in this submission–including interruption to dialysis and ventilation, loss of access to water and heating, and deterioration of physical and mental health–may be relevant to proportionality assessment. In particular, the Commission may wish to consider the cumulative impact of such effects on high-risk populations.

The Commission may also consider the evidence presented here in determining whether the deleterious effects of these attacks on vulnerable populations were foreseeable.[167] The description of pathways of harm are relevant to assessments of whether a reasonable commander would expect that attacks debilitating a state’s electricity and energy infrastructure would cause particular harm to vulnerable health groups who require electricity for treatment and may be unable to endure hardship conditions imposed by outages. The Commission may note that many of the harms described in this submission, including interruptions to dialysis, oxygen therapy, and oncology treatment, were not causally remote or the result of independent action but the immediate result of power cuts from the attack.

They may also note that ”[w]hat is foreseeable will be informed and evolve, in particular, through…analysis of the effects of past attacks,” and that Russian attacks on energy infrastructure have continued at increasing intensity for three years with consistently devastating effects on civilian infrastructure.

The Commission may also note that indirect and reverberating effects must be taken into account when assessing adequate precautions in attack.[168] Consequently, the Commission may conclude that even an attack that is proportional may, considering indirect and reverberating effects, still represent a failure to take all feasible measures to protect civilians from the effects of attack.[169]

Attacks on Objects Indispensable to the Survival of the Civilian Population

Combatants may not attack, destroy, remove, or otherwise render useless objects indispensable to the survival of the civilian population, including, *inter alia*, drinking water installations and supplies.[170] This prohibition extends to pieces of energy infrastructure critical to the effective operation of other indispensable objects.[171] The Commission may wish to consider whether attacks that disabled drinking water supply violate this prohibition.

Crimes Against Humanity

Certain acts taken as part of a widespread or systematic attack on the civilian population, pursuant to state policy, may be crimes against humanity. It is well-established that Russian attacks on Ukrainian energy infrastructure are widespread and systematic.[172] The repeated, large-scale, and coordinated nature of the attack, and the corresponding mobilization of state resources required to enact it, indicate that the attack is pursuant to state policy. The Commission may also reference preliminary conclusions by a Pre-Trial Chamber of the International Criminal Court stating that “the alleged campaign of strikes qualifies as a course of

conduct involving the multiple commission of acts against a civilian population, pursuant to a State policy."[173]

The Commission may also consider that these attacks may constitute the "residual"[174] category of other inhumane acts. In making this determination, the Commission may consider what constitutes great suffering for these purposes must take into account the personal circumstances of the victim including age, sex and health, as well as the physical, mental, and moral effects of the act upon the victim.[175]

Considering the persistent, long-term effects of attacks on heating and energy infrastructure, the Commission may qualify these actions as the forcible transfer of population. To this point, as stated in section 4.4, health professionals see large number of their patients emigrating.[176]

Violations of the Right to Life and Health

The impacts described in this submission may also raise questions under those IHRL obligations that to apply extraterritorially during armed conflict.[177] In particular, the documented disruption of access to life-sustaining medical care, water, sanitation, and heating for affected populations may be relevant to the assessment of obligations relating to the rights to life and health.

7. Conclusions and Recommendations

This scoping study demonstrates that attacks on Ukraine's energy infrastructure create both immediate and long-term health risks for individuals who rely on electricity for life-saving and life-sustaining medical care, whose treatment is dependent on a predictable schedule, stable conditions, and uninterrupted access to basic services.

Chronic disease, disability, mobility limitations, ageing, socio-economic factors, and environmental stressors produce intersecting and compounding effects that intensify vulnerability.

Across interviews, disruptions to medical devices, treatment routines, home-based procedures, and clinical care repeatedly converged with difficult living conditions–water and heating outages, nonfunctioning elevators, absence of alternative sources of power, or inability to access food or medication.

These combined factors undermine people's ability to manage their conditions and lead to constraints on everyday functioning. Dialysis patients, ventilator users, people with significant mobility restrictions, and others face particularly acute and compounding risks.

To support people affected by attacks on energy, their needs have to be understood and studied. Absence of reliable data that could help analyze direct impacts on the wellbeing of these groups and ways to mitigate them create another barrier to providing them with necessary care. Among the needs identified most prominently are resources to obtain alternative sources of power, access to water, and heating. The need for structural, policy, and institutional change was also noted, for instance, regarding the development of an inclusive urban infrastructure.

Together, these findings show the need for further investigation of the downstream impacts of energy attacks on health and the need for humanitarian response that recognizes the complexity of these syndemic interactions.

Recommendations to the Commission of Inquiry:

- Urge the Russian Federation to adhere to international law and stop attacking health care workers and facilities, targeting energy infrastructure essential to civilian life, conducting indiscriminate attacks that endanger both health and civilian energy systems.
- Provide redress for the harm caused in accordance with the Council of Europe Convention establishing an International Claims Commission for Ukraine, taking into consideration damage inflicted on individuals, communities, facilities, and the population in general.
- Encourage the Ukrainian government to improve data collection on the health impacts of power cuts, particularly for electricity-dependent and other sentinel populations.
- Recommend that the Ukrainian government tailor support and protection measures for complex cases of multimorbid and mobility-restricted individuals who face heightened risk during outages.
- Call on the international community to prioritize funding for service providers, including health care facilities, organizations that work with high-risk groups to respond during outages as well as holistic support at individual and household levels, prioritizing people with medical equipment dependencies, multimorbid elderly patients, and those with mobility restrictions who cannot evacuate during outages.
- Recommend that the international community, donors, and partners continue to document, investigate, and seek accountability for attacks on health and energy infrastructure, with particular attention to their downstream effects on the population.

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[1] Ministry of Energy of Ukraine, 'Why Is There No Water When the Power Is Out?', https://mev.gov.ua/en/storinka/why-there-no-water-when-power-out, accessed on December 15, 2025.

[2] ""The batteries don't have time to recharge." KCSA explained why mobile network disappears in Kyiv during power outages," The Babel, November 7, 2022, https://babel.ua/en/news/86715-the-batteries-don-t-have-time-to-recharge-kcsa-explained-why-mobile-network-disappears-in-kyiv-during-power-outages

[3] WHO, "Ukraine: 2024-2025 Winter Risk Assessment", September 2024, https://iris.who.int/server/api/core/bitstreams/f1cc5042-6a7a-47be-9e35-2114488e1d7a/content p. 4.; "Ukraine's Devastated Energy Grid Battles a New Foe: A Sizzling Heat Wave," The New York Times, July 17, 2024, https://www.nytimes.com/2024/07/17/world/europe/ukraine-heat-wave-electricity.html

[4] Per the arrest warrants issued by the International Criminal Court for Mr. Sergei Kuzhugetovich Shoigu, Mr. Valery Vasilyevich Gerasimov, Mr. Sergei Ivanovich Kobylash, and Mr. Viktor Nikolayevich Sokolov who allegedly bear "responsibility for missile strikes carried out by the Russian armed forces against the Ukrainian electric infrastructure from at least 10 October 2022 until at least 9 March 2023", there are reasonable grounds to believe that the suspects intentionally caused great suffering or serious injury to body or to mental or physical health, thus bearing criminal responsibility for the crime against humanity of other inhumane acts, as defined in article 7(1)(k) of the Rome Statute. See International Criminal Court, "Situation in Ukraine: ICC judges issue arrest warrants against Sergei Ivanovich Kobylash and Viktor Nikolayevich Sokolov," March 5, 2024, https://www.icc-cpi.int/news/situation-ukraine-icc-judges-issue-arrest-warrants-against-sergei-ivanovich-kobylash-and, International Criminal Court, "Situation in Ukraine: ICC judges issue arrest warrants against Sergei Kuzhugetovich Shoigu and Valery Vasilyevich Gerasimov," June 24, 2024, https://www.icc-cpi.int/news/situation-ukraine-icc-judges-issue-arrest-warrants-against-sergei-kuzhugetovich-shoigu-and.

[5] Physicians for Human Rights (PHR), which shared in the 1997 Nobel Peace Prize, works at the intersection of medicine, science, and law to end human suffering, save lives, and secure justice and universal human rights for all. Founded in 1986, PHR has more than 35 years of experience working in more than 60 countries to conduct research, launch fact-finding investigations, and galvanize thousands of health professionals and allies in the law enforcement and legal sectors to confront humanitarian emergencies and support justice for victims of human rights violations. Both directly and through the local networks of allied professionals that the organization builds and supports, PHR collects, analyzes, and preserves incontrovertible forensic evidence of abuses to support local, national, and international truth-telling and accountability processes. Our findings also offer policymakers, journalists, and activists information that can be used to reform policies and practices that undermine human rights.

[6] Truth Hounds is a human rights organization that documents and investigates war crimes in Ukraine and Eastern Europe. TH collects witness testimonies and other evidence to contribute to investigations by the International Criminal Court, Ukrainian authorities, and investigators in other states applying universal jurisdiction.
[7] A concept borrowed from epidemiology where surveillance is carried out for specific groups within a population that might help elucidate trends in health harms. See Kahler Stone, Jennifer A. Horney, "Disaster Epidemiology. Methods and Applications. Chapter 2 - Methods: Surveillance," 2018, Pages 11-23, https://www.sciencedirect.com/science/chapter/edited-volume/abs/pii/B9780128093184000022. A sentinel event is a patient safety event (not primarily related to the natural course of a patient's illness or underlying condition) that reaches a patient and results in death, severe harm (regardless of duration of harm), or permanent harm (regardless of severity of harm). An event can also be considered sentinel event even if the outcome was not death, permanent harm, severe harm and intervention required to sustain life. Such events are called "sentinel" because they signal the need for immediate investigation and response. See "Joint Commission, Sentinel Event Policy and Procedures," https://www.jointcommission.org/en-us/knowledge-library/support-center/standards-interpretation/sentinel-event-policy-and-procedures
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[165] "Report on Violations of International Humanitarian and Human Rights Law, War Crimes and Crimes against Humanity Committed in Ukraine since 24 February 2022," Organization for Security and Co-operation in Europe, April 22, 2022, p. 29, https://www.osce.org/files/f/documents/f/a/515868.pdf. See also Isabel Robinson and Ellen Nohle, "Proportionality and precautions in attack: The reverberating effects of using explosive weapons in populated areas," International Review of the Red Cross, 2016, 98 (1), 107–145, https://international-review.icrc.org/sites/default/files/irc_97_901-9.pdf; "International Humanitarian Law and the Challenges of Contemporary Armed Conflict in 2019," ICRC, para.38, 36, 50, https://casebook.icrc.org/case-study/icrc-international-humanitarian-law-and-challenges-contemporary-armed-conflict-2019.
[166] "International Humanitarian Law and the Challenges of Contemporary Armed Conflict in 2019," ICRC, para.37, https://casebook.icrc.org/case-study/icrc-international-humanitarian-law-and-challenges-contemporary-armed-conflict-2019.

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[168] “International Humanitarian Law and the Challenges of Contemporary Armed Conflict in 2019,” ICRC, para.50, https://casebook.icrc.org/case-study/icrc-international-humanitarian-law-and-challenges-contemporary-armed-conflict-2019.
[169] See AP I Art. 57(1), Art. 57(2)(a)(ii); see also Michael W. Meier, “The Principle of Proportionality in the DoD Law of War Manual,” Just Security, January 18, 2024, https://www.justsecurity.org/91319/the-principle-of-proportionality-in-the-dod-law-of-war-manual/ (stating that assessment of feasible precautions is broader than that of proportionality).
[170] AP I Art. 54(2).
[171] Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977, Commentary of 1987, https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-54/commentary/1987, but also: Dinstein Y., “Specific Methods of Warfare. In: The Conduct of Hostilities under the Law of International Armed Conflict, Cambridge University Press; 2022:288-349, p. 289, https://www.cambridge.org/core/books/abs/conduct-of-hostilities-under-the-law-of-international-armed-conflict/specific-methods-of-warfare/F140F12F0C455B03C3697B7BC778135D; Shue, Henry and Wippman, David, "Limiting Attacks on Dual-Use Facilities Performing Indispensable Civilian Functions," 2002, Cornell International Law Journal: Vol. 35: Iss. 3, Article 7, https://scholarship.law.cornell.edu/cgi/viewcontent.cgi?article=1520&context=cilj; Michael N. Schmitt, “Further Thoughts on Russia’s Campaign against Ukraine’s Power Infrastructure,” Lieber Institute's Articles of War, November 25, 2022, https://lieber.westpoint.edu/further-thoughts-russias-campaign-against-ukraines-power-infrastructure/; Tom Dannenbaum, “Criminalizing Starvation in an Age of Mass Deprivation in War: Intent, Method, Form, and Consequence,” Vanderbilt Journal of Transitional Law, July 5, 2022, https://www.transnat.org/post/criminalizing-starvation-in-an-age-of-mass-deprivation-in-war-intent-method-form-and-consequence.
[172] Report of the Independent International Commission of Inquiry on Ukraine, paras. 24, 41-42, September 25, 2023, https://docs.un.org/en/A/HRC/52/62; “Attacks on Ukraine’s Energy Infrastructure: Harm to the Civilian Population,” UN Human Rights Monitoring Mission, September 2024, p. 2, https://ukraine.ohchr.org/sites/default/files/2024-09/ENG%20Attacks%20on%20Ukraine%E2%80%99s%20Energy%20Infrastructure-%20%20Harm%20to%20the%20Civilian%20Population.pdf; see also “Civilian Casualties Mount as Russian Armed Forces Step Up Attacks on Ukraine’s Energy Infrastructure Ahead of Winter, UN Human Rights Monitors Say,” OHCHR, November 25, 2025, https://ukraine.un.org/en/305972-civilian-casualties-mount-russian-armed-forces-step-attacks-ukraine%E2%80%99s-energy-infrastructure.
[173] See International Criminal Court, “Situation in Ukraine: ICC judges issue arrest warrants against Sergei Ivanovich Kobylash and Viktor Nikolayevich Sokolov,” March 5, 2024, https://www.icc-cpi.int/news/situation-ukraine-icc-judges-issue-arrest-warrants-against-sergei-ivanovich-kobylash-and; International Criminal Court, “Situation in Ukraine: ICC judges issue arrest warrants against Sergei Kuzhugetovich Shoigu and Valery Vasilyevich Gerasimov,” June 24, 2024, https://www.icc-cpi.int/news/situation-ukraine-icc-judges-issue-arrest-warrants-against-sergei-kuzhugetovich-shoigu-and.
[174] Kupreskic et al., (Trial Chamber), January 14, 2000, para. 563
[175] Kordic and Cerkez, (Trial Chamber), February 26, 2001, para. 271-272
[176] With respect to the general population outside the scope of this report, attacks degrading energy infrastructure serve as a primary motivation for emigration. See “Attacks on Ukraine’s Energy Infrastructure: Harm to the Civilian Population,” UN Human Rights Monitoring Mission, September 2024, p. 2, https://ukraine.ohchr.org/sites/default/files/2024-09/ENG%20Attacks%20on%20Ukraine%E2%80%99s%20Energy%20Infrastructure-%20%20Harm%20to%20the%20Civilian%20Population.pdf.
[177] See HRC, General Comment No. 36, 67; The right to health, also - as contained in the International Covenant on Economic, Social and Cultural Rights (ICESR) and other instruments - requires at its core that states refrain from restricting access to essential health care in territory under their control, in particular to marginalized groups, and to sanitation and safe drinking water. See International Covenant on Economic, Social and Cultural Rights, Article 12, https://www.ohchr.org/en/instruments-mechanisms/instruments/international-covenant-economic-social-and-cultural-rights; Office of the High Commissioner for Human Rights, “The Right to Health: Fact Sheet No. 31,” at 25. See also “The Court holds Russia accountable for widespread and flagrant abuses of human rights arising from the conflict in Ukraine since 2014, in breach of the European Convention on Human Rights,” European Court of Human Rights, July 9, 2025, https://hudoc.echr.coe.int/app/conversion/pdf/?library=ECHR&id=003-8279845-11657965&filename=Grand%20Chamber%20judgment%20Ukraine%20and%20the%20Netherlands%20v.%20Russia%20-%20the%20Court%20holds%20Russia%20accountable%20for%20widespread%20and%20flagrant%20abuses%20of%20human%20rights%20arising%20from%20the%20conflict%20in%20Ukraine%20since%202014.pdf