

TARGETING THROUGH DEPRIVATION: RUSSIA'S ATTACKS ON UKRAINIAN ENERGY AND NUCLEAR INFRASTRUCTURE — AN INTERNATIONAL HUMANITARIAN LAW PERSPECTIVE

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Abstract: *Since October 2022 the Russian Federation has conducted successive waves of coordinated strikes on Ukraine’s electricity generation, transmission and district-heating infrastructure, together with the military seizure of the Zaporizhzhia Nuclear Power Plant. This paper develops a single-case study, with three embedded units of analysis, to test the hypothesis that these attacks constitute a method of indirect targeting of the civilian population: they aim to produce sufficient suffering to decouple popular support from the political authority and war aims of the Ukrainian State. The case is examined through the lens of the 1949 Geneva Conventions, the 1977 Additional Protocol I, customary international humanitarian law, and the Rome Statute. Open-source evidence from United Nations (UN), International Atomic Energy Agency (IAEA), International Energy Agency (IEA) and World Bank sources is triangulated to establish a factual pattern on the “reasonable grounds to believe” standard. The paper argues that the systematic, winter-timed and nationwide character of the campaign cannot be reconciled with the dual-use doctrine and generates individual criminal responsibility, consistent with the International Criminal Court arrest warrants issued in 2024 against senior Russian commanders.*

Keywords: international humanitarian law, energy infrastructure, nuclear power plants, indirect targeting, Ukraine

1. Introduction

Russia’s strategic campaign against Ukraine’s energy infrastructure, which began on 10 October 2022 and has continued through every subsequent winter, is quantitatively documented on an unusual scale. In October 2022 alone, Ukraine’s energy facilities were struck 82 times — more than in all preceding months of the full-scale invasion combined. Between October 2022 and late January 2023, 1,350 Russian rockets and drones were directed at energy infrastructure; by February 2023 some 255 strikes had hit 112 energy facilities across 24 of Ukraine’s 27 administrative regions, with 77% of strikes concentrated in the four cold-season months between

October 2022 and February 2023 [1].

The campaign also shifted qualitatively at that inflection. Prior to 10 October 2022, Russian attacks on energy assets had largely targeted oil refineries and electric substations serving railways — infrastructure that supports military logistics. After 10 October 2022, electric substations and thermal power plants producing both electricity and heating for the civilian population became the focus of attacks across 20 of Ukraine’s 24 government-controlled oblasts [1]. The United Nations (UN) Independent International Commission of Inquiry on Ukraine concluded that the large-scale attacks launched between 10 October 2022 and 26 January 2023 were “widespread and systematic” [1, 4]. The Kyiv

School of Economics Institute estimated direct damage to energy infrastructure at USD 8.3 billion by April 2023 [1]. Remote-sensing assessment by Hathaway et al. at the Yale School of Public Health's Humanitarian Research Lab and the Ukraine Digital Verification Lab found the pattern of damage, read together with public statements of Russian officials, consistent with a targeted effort to cripple Ukraine's power generation and transmission capacity [1].

Between 22 March and 31 August 2024 alone, the UN Human Rights Monitoring Mission in Ukraine (HRMMU) documented nine additional waves of large-scale coordinated attacks on Ukraine's electric power system [2]. By June 2024 approximately 73% of thermal-power capacity and 20 hydroelectric units were inoperative; by mid-2024 Ukraine retained only about one third of its pre-war generating capacity [2]. In parallel, the Zaporizhzhia Nuclear Power Plant (ZNPP) — Europe's largest — has been under Russian military control since 4 March 2022 and by late 2025 had experienced its tenth complete loss of off-site power [3].

The conventional framing — that electrical grids are dual-use objects and therefore lawful military objectives — is increasingly seen as inadequate to capture the pattern, timing and scale of the Russian campaign. This paper asks a different question: whether the civilian population is, in fact, the real addressee of the attacks. It develops this inquiry from an International Humanitarian Law (IHL) perspective, organized around a single in-depth case study.

2. Hypothesis

2.1. Principal hypothesis

The Russian Federation's systematic campaign against Ukrainian energy infrastructure — including the seizure and operational destabilization of the ZNPP — constitutes a method of *indirect targeting of the civilian population*. Its operational objective is to degrade the conditions of civilian life to a threshold at which popular

support for Ukraine's national political objectives (territorial integrity, state continuity, resistance to occupation) becomes unsustainable — that is, to *coercively decouple the civilian population from the political authority and war aims of the Ukrainian State*. Such a design is unlawful under IHL: it violates the principles of distinction and proportionality, the special protection regime for objects indispensable to civilian survival and for installations containing dangerous forces, and the prohibition of acts whose primary purpose is to spread terror among civilians.

2.2. Subsidiary hypotheses

H1 — Systematicity. The temporal clustering of strikes at the onset of each heating season (October 2022, autumn 2023, March–August 2024, autumn–winter 2025–2026) and their nationwide geographic spread across 20 of 24 Ukrainian-controlled regions demonstrate a coordinated state policy rather than a succession of tactical choices [2, 4].

H2 — Purpose and reverberating effects. The cascading consequences on water, sanitation, heating, medical care, education and internal displacement exceed any plausible concrete and direct military advantage within the meaning of Article 52(2) of Additional Protocol I (AP I) and are better explained by a coercive strategy directed at civilian morale and political cohesion [5, 6].

H3 — Individual criminal responsibility. The conduct satisfies the *actus reus* and *mens rea* of the war crimes defined in Articles 8(2)(b)(ii), 8(2)(b)(iv) and 8(2)(b)(xxv) of the Rome Statute, as reflected in the arrest warrants issued by the International Criminal Court (ICC) on 5 March and 24 June 2024 against S. Kobylash, V. Sokolov, S. Shoigu and V. Gerasimov for the campaign against Ukraine's electric infrastructure [7, 8].

3. Objectives and research questions

The paper pursues four interlocking objectives, each paired with a research

question:

Objective 1 — To map the International Humanitarian Law (IHL) framework governing attacks on energy infrastructure and on installations containing dangerous forces, isolating the norms most relevant to a campaign conducted between two States parties to Protocol Additional to the Geneva Conventions of 12 August 1949 (AP I).

RQ1. Does Russia's attack pattern qualify as an attack directed against civilians and civilian objects within the meaning of Articles 48, 51(2), 52(2), 54, 56 and 85(3) AP I, read together with customary IHL and the International Atomic Energy Agency (IAEA)'s Seven Indispensable Pillars of Nuclear Safety?

Objective 2 — To establish the factual pattern of the campaign from 10 October 2022 to the winter of 2025–2026, using UN, IAEA, International Energy Agency (IEA), World Bank and independent investigative sources.

RQ2. What is the scale, seasonal distribution, weapon-type profile and geographic reach of the attacks, and what reverberating effects have they produced on civilian life-support systems?

Objective 3 — To diagnose the strategic rationale underlying the campaign and demonstrate — from public statements, target selection, timing and weapon choice — that the civilian population is the intended addressee.

RQ3. Is the evidence of seasonal timing, nationwide geographic distribution, precision of munitions and official rhetoric sufficient to infer a specific intent to coerce the civilian population into pressuring its government toward political concessions?

Objective 4 — To subject the dual-use doctrine to critical scrutiny and show that, even on its most permissive reading, the proportionality rule and the prohibition in Article 54 AP I are violated when foreseeable indirect effects are properly integrated into the targeting analysis.

RQ4. To what extent can the dual-use characterization of power infrastructure be

sustained when the foreseeable reverberating effects on water, sanitation, heating, healthcare and education are integrated into the proportionality assessment under Articles 51(5)(b) and 57 AP I?

4. Methodology

The paper adopts the case-study method as its single research strategy. This choice responds to the nature of the research problem, which is not the statistical frequency of an event but the legal-normative characterization of a complex, temporally extended and strategically coherent course of State conduct. As Argyrou observes in her treatment of the case-study method in empirical legal research, the case-study strategy is particularly well suited to legal inquiries that combine doctrinal analysis with the systematic examination of a real-world phenomenon in its context, and where the research asks "how" or "why" questions about a contemporary phenomenon over which the investigator has no control [9]. Each of these conditions is satisfied here.

The research design is a single-case study with three embedded units of analysis [9]. The case is Russia's strategic bombardment of Ukrainian energy infrastructure from 10 October 2022 to 31 March 2026. The three embedded sub-cases are: (A) the thermal and hydroelectric generation and transmission grid; (B) the nuclear dimension, centred on the ZNPP; and (C) the gas production, distribution and district-heating network. The embedded design allows the same theoretical framework — the principles of distinction, proportionality and precaution, together with the special protection regimes of Articles 54 and 56 AP I — to be applied across distinct asset classes, each with its own technical characteristics and legal status.

The unit of analysis is the Russian campaign considered as a coherent course of conduct, rather than any single strike. This is consistent with the approach of the UN

Independent International Commission of Inquiry on Ukraine [4] and the ICC Pre-Trial Chamber II, which in its 5 March 2024 warrants characterised the strikes as a *campaign* of attacks [7].

The evidentiary corpus comprises: (i) the Hathaway et al. remote assessment produced by the Yale School of Public Health's Humanitarian Research Lab and the Ukraine Digital Verification Lab [1]; (ii) thematic and periodic reports of HRMMU and of the UN Commission of Inquiry on Ukraine [2], [4]; (iii) IAEA Director-General updates and situation reports on the ZNPP [3]; (iv) the Organisation for Economic Co-operation and Development/ Nuclear Energy Agency (OECD/ NEA) chronology of incidents at Ukrainian nuclear installations; (v) the International Energy Agency's assessments of Ukraine's energy security [10]; (vi) the successive Rapid Damage and Needs Assessments (RDNA3–RDNA5) jointly produced by the Government of Ukraine, the World Bank, the European Commission and the UN [11]; and (vii) reporting by Amnesty International and Human Rights Watch. The evidentiary standard applied is *reasonable grounds to believe* — the threshold used by UN commissions of inquiry and for ICC arrest warrants — rather than the higher criminal standard of proof beyond reasonable doubt.

Construct validity is strengthened through source triangulation: each factual claim is, where possible, corroborated by at least two independent sources drawn from different institutional categories (UN organ, inter-governmental agency, NGO). External validity is deliberately restricted: the conclusions reached are specific to the Russo-Ukrainian case but contribute to a theoretically generalizable reading of the relevant IHL norms. The principal limitation is that Russian primary sources (official targeting doctrine, strike lists) are not accessible; intent is therefore inferred through converging open-source indicators — target selection, seasonal timing, weapon precision and official statements. The paper

takes no position on *jus ad bellum* questions except insofar as they inform the IHL analysis.

5. Case study: Russia's campaign against Ukrainian energy infrastructure

5.1. Scope and chronology of the campaign

The campaign opened with the coordinated wave of 10 October 2022 set out in the Introduction. For the seven months that followed — Phase I of the campaign — the best-verified single evidentiary corpus is the Hathaway et al. remote assessment covering 1 October 2022 to 30 April 2023, which documented 223 incidents of damage to Ukraine's power generation and transmission infrastructure, 66 of them confirmed at the time of publication through satellite imagery and open-source cross-referencing [1]. Over the autumn and winter of 2022–2023, weekly barrages produced rolling blackouts nationwide and required the creation of Ukrainian "points of invincibility" — shelter-type locations where civilians could charge devices and warm themselves during outages. A second intensification occurred in March–August 2024 (Phase III): the HRMMU documented nine distinct waves of long-range coordinated strikes against electricity generation, transmission and distribution facilities during this window [2]. The 26 August 2024 attack alone involved more than 100 missiles and 100 drones across numerous regions [2]. A further intensification followed in November 2024 (120+ missiles and 90 drones on 17 November) and, most significantly, in the winter of 2025–2026 (Phase IV).

In early 2026, Russia ended a US-brokered pause on strikes against energy infrastructure by launching, on 2–3 February, what Ukrainian authorities described as the largest missile-and-drone attack of the year. Strikes were reported in Kyiv, Dnipro, Kharkiv, Sumy, Zaporizhzhia and Odesa during a cold spell in which overnight temperatures fell to -17°C in

Kyiv and $-23\text{ }^{\circ}\text{C}$ in Kharkiv; 1,170 residential buildings in the capital and approximately 820 high-rise buildings in Kharkiv were left without heating [12]. Civilian casualty data compiled by the UN for the first five months of 2025 show infrastructure-linked civilian casualties approximately 50% higher than in the equivalent period of 2024 [4].

5.2. Sub-case A: Thermal and hydroelectric generation

The thermal generation fleet has sustained the most severe damage. By June 2024, 73% of Ukraine's thermal generating capacity was inoperative and 20 hydroelectric units had been disabled [2]. Damage to the Kakhovka hydroelectric complex in June 2023 illustrates the compound nature of the harm: the destruction of the dam not only removed generating capacity but produced a downstream flood, depleted the cooling-water reservoir of the ZNPP, and displaced tens of thousands of civilians. The RDNA5 of February 2026 recorded a 21% further increase in damaged or destroyed energy assets relative to the previous assessment of February 2025 [11]. Total reconstruction and recovery costs now stand at approximately USD 588 billion — nearly three times Ukraine's projected nominal GDP for 2025 [11].

5.3. Sub-case B: The nuclear dimension — ZNPP

The nuclear dimension is structurally distinct. The ZNPP has been under Russian military control since 4 March 2022 and, since September 2022, under continuous IAEA monitoring. All six reactors have been placed in various states of shutdown, but the plant still requires external power for the cooling of the reactor cores and of the spent-fuel pools. Between February 2022 and the winter of 2025–2026 the plant lost off-site power on ten separate occasions, with the longest event — beginning on 23 September 2025 — lasting approximately one month and requiring sustained reliance on emergency diesel generators [3]. On each such occasion the margin between nuclear

safety and the release of "dangerous forces" within the meaning of Article 56 AP I narrowed materially.

The IAEA has noted explosions, military activities and fires in the immediate vicinity of the plant, including artillery fire approximately 400 metres from the off-site diesel-fuel storage facility on 16 September 2025 [3]. In December 2025 and February 2026 respectively, Russia's nuclear regulator Rostekhnadzor issued ten-year operating licences for Units 1 and 2 of the plant, while Rosatom has stated its intention to obtain Russian licences for all six units by the end of 2027 [13]. The Ministry of Energy of Ukraine has characterised the Rostekhnadzor licensing as "legally null and void," emphasising that the ZNPP falls under the exclusive jurisdiction of Ukraine and that the only competent nuclear regulatory authority on its territory remains the State Nuclear Regulatory Inspectorate of Ukraine; Ukraine has invoked UN General Assembly Resolution A/RES/78/316 and decisions of the IAEA Board of Governors in support of this position [14]. For the purposes of this paper, the ZNPP functions as a dual instrument: it has withdrawn approximately 5.7 GW of generating capacity from the Ukrainian grid since March 2022, while generating a persistent radiological risk that, on the analysis advanced here, operates as coercive leverage against the Ukrainian State and its civilian population.

The repeated severance of off-site power lines supplying the site, on both sides of the front line, is of particular legal significance. Under Article 56(1) AP I, attacks that "may cause the release of dangerous forces and consequent severe losses among the civilian population" are prohibited even where the target qualifies as a military objective. A sustained loss of cooling capacity — whether produced directly by a strike on the plant or indirectly by attacks on the transmission assets on which it depends — is precisely the mechanism through which a radiological release would occur. The

OECD/ NEA chronology records ten complete losses of off-site power between 2022 and 2026, as well as multiple near-miss incidents in the airspace of other Ukrainian nuclear facilities during the same period. The pattern makes the nuclear risk not a hypothetical by-product of the campaign but a constitutive element of it.

5.4. Sub-case C: Gas production and district heating

Attacks on gas infrastructure have targeted above-ground production and compression facilities, transmission and distribution networks, and district-heating substations. By early 2025 Russian strikes had damaged approximately 40% of Ukraine's gas-production capacity [15]; the position deteriorated further on 3 October 2025, when a single barrage of 35 missiles and 60 drones directed at facilities in Kharkiv and Poltava oblasts reportedly destroyed about 60% of Ukraine's remaining domestic gas production ahead of the 2025–2026 winter [16]. District heating is particularly critical because Ukrainian winters routinely feature sub-zero temperatures; residential heating infrastructure is not a dual-use target in any meaningful sense, yet it has been struck repeatedly. The 2–3 February 2026 strikes left approximately 1,170 residential buildings in Kyiv and 820 high-rise buildings in Kharkiv without heating in temperatures that fell to -17°C in the capital and -23°C in Kharkiv [12].

5.5. Reverberating effects on the civilian population

The HRMMU assessment of September 2024 identifies a series of cascading effects attributable to the energy strikes: disruption of water distribution, sewage and sanitation; loss of heating and hot water; degradation of public health, education and the broader economy [2]. Specific indicators include: approximately 10% of the population (3.7 million people) placed at risk of consuming contaminated drinking water after the March–August 2024 waves; between 78 and 311 million hours of school time lost per month to power outages in July 2024; and

UNHCR survey data showing that by July 2024 almost half of Ukrainians crossing the border cited difficulty accessing electricity, water and heating as their reason for departure [2]. UNHCR projected an additional 500,000 displacements ahead of the 2024–2025 winter as a direct consequence of the energy crisis [2].

These effects are not peripheral collateral damage: they are the foreseeable and, on the record, publicly anticipated consequences of striking the infrastructure on which an entire country's modern life-support systems depend. The assessment of HRMMU is that these attacks are widespread and systematic, and that there are reasonable grounds to believe multiple aspects of the campaign have violated foundational principles of IHL [2].

5.6. Indicators of intent

Four converging indicators support the inference that the civilian population is the intended addressee of the campaign. First, seasonal timing: the waves cluster at the onset of the heating season and at cold snaps, not with the tempo of ground operations [2], [4]. Second, target composition: within a single wave, Russia routinely strikes district-heating substations, combined heat-and-power plants and residential high-voltage nodes alongside transmission — the mixture is not explicable by any narrow military-operational logic. Third, weapon choice and precision: the campaign has employed long-range precision-guided cruise missiles (Kh-101, Kalibr) and Shahed-class loitering munitions, confirming that the targets struck were the targets selected. Fourth, official discourse: Russian officials have publicly characterised energy infrastructure as a legitimate military target, while Ukrainian leadership and allied governments have repeatedly described the campaign as designed to "terrorise" the population [7], [12]. The ICC Pre-Trial Chamber II, in issuing warrants against Kobylash and Sokolov, accepted that there were reasonable grounds to believe the strikes were directed at civilian objects and caused excessive incidental harm [7].

5.7. From systematicity to strategic coercion

The four indicators establish that civilians are the addressee of the strikes; they do not yet establish the strategic rationale that drives that targeting. To answer that question, the case must be tested against the established framework for analysing strategic air campaigns. Pape's classic typology, recently re-applied to the Russia–Ukraine context, distinguishes punishment strategies (raising costs to the civilian population in order to compel political concessions from its government) from denial strategies (degrading the adversary's military capacity to continue fighting) [17]. The two strategies select different targets and follow different operational rhythms.

The Russian pattern fits the punishment-coercion model rather than the denial model. The seasonal concentration of strikes — 77% in the four cold-season months between October 2022 and February 2023 [1] — tracks civilian vulnerability rather than the operational tempo of the front. The geographic spread across 20 of 24 government-controlled oblasts [2], including regions far from the line of contact, is inconsistent with a denial logic targeting deployable forces. The qualitative shift after 10 October 2022 from logistical assets (oil refineries, railway substations) to civilian-supporting assets (heating substations, thermal power plants) [1] reverses, rather than intensifies, the pattern that a denial strategy would predict.

The UN Commission of Inquiry's October 2024 report records that the resulting blackouts, "at times affecting millions of civilians," curtailed civilians' enjoyment of the rights to health and education and produced "feelings of distress, anxiety, and isolation" — reverberating effects that, on the Pape framework, are the operative mechanism of a punishment strategy rather than incidental by-products of a military operation [4]. The Commission characterised the strikes as part of "widespread and systematic attacks against

the civilian population, pursuant to a state policy" [4]. Read together, the empirical pattern, the declaratory record and the UN Commission's qualification support the principal hypothesis: the campaign's strategic objective is to coerce the civilian population into withdrawing the political and material support that sustains Ukraine's war effort — that is, to decouple the population from the regime — and not merely to degrade military capacity through dual-use targeting.

5.8. Outcomes: the empirical record –

Whether the campaign has achieved its intended coercive effect is an empirical question that the case-study evidence allows to be tested separately from the legal characterization of the conduct. The data point in two directions, and the divergence is itself analytically significant. On the one hand, the indicators of civilian war fatigue — the operative mechanism of any punishment strategy — have moved measurably in the direction the campaign would predict. According to Gallup's July 2025 survey, the share of Ukrainians who believed the country should "continue fighting until victory" fell from 73% in 2022 to 24% in 2025, while the share favouring negotiations "as soon as possible" rose from 22% to 69%; the share believing Ukraine would join NATO within 10 years dropped from 64% to 32% over the same period [18]. The Kyiv International Institute of Sociology (KIIS) December 2025 survey recorded a corresponding willingness to accept terms that would have been politically inconceivable in 2022: 72% of respondents would support a peace plan that froze the front line, provided Ukraine received security guarantees and the occupied territories were not formally recognised as Russian [19]. As of February 2026, 3.7 million people were internally displaced inside Ukraine and 5.9 million refugees were registered abroad — close to one in three Ukrainians forced from their homes [20]. On the other hand, the political objective of decoupling popular support

from the State has not been achieved. Despite a major domestic corruption scandal that produced the resignation of the Head of the Presidential Office, KIIS recorded 61% trust in President Zelensky in December 2025; only 9% of Ukrainians wanted national elections before the end of hostilities, and 75% described Russia's maximalist demands (army reduction, abandonment of NATO aspirations, recognition of annexed territories) as "completely unacceptable." Sixty-three percent reported they were prepared to keep fighting, and only 17% would accept Moscow's terms [19]. The pattern conforms to Pape's central finding: punishment strategies impose substantial costs on civilian populations and produce measurable war fatigue, but rarely succeed in coercing the targeted government into political concessions [17]. For the legal argument advanced here, this divergence has a specific implication. The unlawfulness of the campaign under Articles 51, 52, 54 and 56 AP I, and its qualification as a method of indirect targeting, do not depend on whether the strategy succeeds; they depend on the design and the foreseeable effects of the conduct. The empirical record confirms that those effects have been produced even where the strategic objective has not.

6. Applicable legal framework

The case study engages five IHL pillars. First, the principle of distinction (Articles 48, 51 and 52 AP I) prohibits the sweeping classification of an entire national grid as a military objective [21]. Second, Article 54 AP I prohibits attacks on objects indispensable to the survival of the civilian population for the specific purpose of denying them to civilians, whatever the motive; a growing line of scholarship — Schmitt in particular [5], with the European Papers analysis extending the approach [6] — reads electricity and district heating in sub-zero conditions within that provision. Third, Article 56 AP I prohibits attacks on nuclear electrical generating stations — even where they qualify as military objectives — if such

attacks may cause the release of dangerous forces and consequent severe losses among the civilian population. The rule is reflected in customary international humanitarian law (Rule 42 of the ICRC Study) [22]. Russia and Ukraine are both parties to AP I without relevant reservations [23]. Fourth, proportionality and precautions (Articles 51(5)(b), 57 and 58 AP I) require foreseeable cascading effects to be integrated into the targeting analysis [5]. Fifth, Articles 7 and 8 of the Rome Statute ground the individual criminal responsibility confirmed in the ICC's 2024 warrants [7, 8].

7. Conclusions

Applied to the case thus constructed, the IHL framework supports the principal hypothesis. The campaign's systematicity (H1) is established by the chronology, geographic distribution and coordinated character of the waves. The disproportionate nature of the reverberating effects (H2) follows from the quantitative indicators on water, heating, displacement and education and, more fundamentally, from the analysis in section 5.7: the empirical pattern, the declaratory record and the UN Commission of Inquiry's findings together support the inference that the campaign is a punishment-coercion strategy in the Pape sense — its strategic objective is to decouple the Ukrainian civilian population from the political authority and war aims of the State, not merely to degrade military capacity through dual-use targeting. The mens rea for individual criminal responsibility (H3) is reflected in the ICC warrants and in the convergence of the four intent indicators identified in section 5.6. The outcomes evidence presented in section 5.8 confirms that the campaign has imposed substantial costs on the civilian population and produced measurable shifts in public attitudes; it equally confirms that political decoupling has not been achieved, since trust in the State has held and majorities continue to reject any peace on Russian terms. The unlawfulness of the conduct under IHL is

independent of the strategy's operational success. The paper's contribution is to integrate these strands around the concept of indirect targeting: the civilian population is not the collateral victim of otherwise lawful counter-military operations, but the coercive object of the campaign itself.

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