UPRAVLJANJE POŽARNIM RIZICIMA NA GLAVNOJ GASNOJ KRITIČNOJ INFRASTRUKTURI U BOSNI I HERCEGOVINI GASNI SISTEM KANTONA SARAJEVO

Stručni rad

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Sažetak:

Značaj energetske sigurnosti u zemljama Jugoistočne Europe, u kontekstu pouzdanosti i sigurnosti snabdijevanja je uvijek bio u fokusu nacionalne sigurnosti i nacionalne ekonomije država te regije. Ovo naročito u vrijeme sve većih rizika koji se odvijaju na međunarodnom planu u pogledu rata Ruske Federacije protiv Ukrajine, a gledajući kroz kontekst da se prirodni gas najvećim dijelom doprema na područja Jugoistočne Europe (pa i Europske unije) putem prav(a)ca iz Ruske Federacije. U ovom radu ćemo se bazirati na mikroprostor Bosne i Hercegovine, tačnije na najveću gasnu infrastrukturu u Bosni i Hercegovini, a to je gasni sistem Kantona Sarajevo. Kada se govori o gasnoj infrastrukturi prvi rizici po ovu infrastrukturu su požarni rizici, koji mogu dovesti do požarnih uzroka i posljedica, odnosno razvoja požara i eksplozija na gasnim postrojenjima i gasnoj mreži. Da do ovoga ne bi došlo ulaže se velika pozornost i ozbiljnost, te se provode mjere i aktivnosti na prevenciji i sprečavanju da požarni rizici pređu u požarne posljedice. To podrazumijeva da distributer gasa u saradnji sa partnerima, te nadležnim javnim organima i institucijama ulaže maksimum napora, radi praktičnog provođenja zakonskih, tehničkih i tehnoloških propisa i standarda, svojstvenih ovoj specifičnoj oblasti energetike i sigurnosti oblasti, a ta aktivnost se obavlja 24/7.

***Ključne riječi**: Zaštita od požara, zaštita od eksplozija, gasna mreža, gasna postrojenja, rizici, upravljanje rizicima, prevencija, provođenje zakonskih odredbi, standardi, tehnička pravila.*

Uvod

U svjetskim odnosima gasna infrastruktura predstavlja sami vrh nacionalnih interesa zemalja Europske unije, ali i drugih zemalja Europe koji još nisu članicom EU, tu posebno misleći na Bosnu i Hercegovini. Bosna i Hercegovina je prije tačno 50 godina, krenula u generacijski projekat izgradnje gasne mreže kojom se tada htjelo riješiti zagađenje glavnog grada BiH, Sarajeva, te se osigurati doprema pouzdanog i ekološki prihvatljivog energenta za ljudsko zdravlje, stvaranje optimalne toplotne energije, zaštitu okoliša i izgradnju industrije tog perioda. Devedesetih godina prošlog vijeka, Sarajevo kao i cijela BiH su bili pogođeni strašnim ratom koji je pored stradanja ljudi jako pogodio i gasnu infrastrukturu u smislu njenog rastresanja i vibriranja unutar zemlje usljed djelovanja minsko-eksplozivnih naprava. Također, jedan dio mreže je (do)građen u ratu, što predstavlja poseban izazov na očuvanju i eksploataciji infrastrukture koja potiče iz ovog perioda. Aktuelno gledajući, najveći izazov i rizik po gasnu infrastrukturu trenutno u Kantonu Sarajevo predstavlja nelegalna (do)gradnja objekata, te provođenje nelegalnih aktivnosti u zaštitnom pojasu gasovoda, što stvara direktnu opasnost po one koji takve radove izvode, te druge ljude, imovinu, te samo gasni sistem u cjelini. Kada govorimo o ovoj temi, kontekst promatranja pojma upravljanja rizicima a samim tim i sigurnosti moramo gledati u kroz današnje događaje, na način da „sigurnost i sigurnosne znanosti pokrivaju mnoga područja i zahtijevaju sveobuhvatni, ali i multidisciplinarni pristup zbog raznovrsnosti tih područja. Ta činjenica posebno dolazi do izražaja u 21. stoljeću kad se fokus u području sigurnosti počinje sve više odmicati od tradicionalnih shvaćanja i ratnih djelovanja“ (Kadić, 2024).

Zakonska legislativa, tehnička regulativa, standardi – važnost i primjena

I dalje u periodu od preko 30 godina nakon samostalnosti, Bosna i Hercegovina nema usvojen zakon o gasu. Umjesto toga koriste se propisi entitetskog nivoa ili čak nižih nivoa. Konkretno kada je Kanton Sarajevo u pitanju temeljno referentni su slijedeći propisi za oblast gasne privrede i infrastrukture:

- Uredba o organizaciji i regulaciji sektora gasne privrede (Službene novine Federacije BiH, broj: 83/07),
- Pravilnik o preuzimanju i primjeni tehničkih propisa za oblast projektovanja, građenja, puštanja u pogon, eksploatacije i održavanja postrojenja i instalacija prirodnog gasa (Službene novine Federacije BiH, broj: 83/08),
- Uredba o snabdijevanju prirodnim gasom Kantona Sarajevo (Službene novine Kantona Sarajevo broj 22/16),

- Pravilnik o uslovima za nesmetanu i sigurnu distribuciju prirodnog gasa distributivnim gasnim sistemom pritiska do 16 bara (Službene novine Kantona Sarajevo broj 40/2017),
- Tehnička pravila,
- Standardi,
- Interne procedure distributera.

U pogledu sigurnosti, konkretno zaštite od požara, primarno su referentni slijedeći propisi i dokumenti:

- Zakon o zaštiti i spašavanju ljudi i materijalnih dobara od prirodnih i drugih nesreća (Službene novine Federacije BiH, broj: 39/03, 22/06 i 43/10),
- Zakon o zaštiti od požara i vatrogastvu (Službene novine Federacije BiH, broj 64/09),
- Podzakonska akta iz ove oblasti,
- Procjene i planovi zaštite i spašavanja od prirodnih i drugih nesreća,
- Procjene i planovi zaštite od požara.

Dosljednom primjenom i provođenjem ovih propisa, pravila, standarda i dokumenata se može osigurati optimalna sigurnost i pametno upravljanje požarnim rizicima. Međutim to nije uvijek slučaj u praksi, naročito kada govorimo o primjeni ovih propisa od strane trećih lica, koja svojim nepropisnim radom ugrožavaju gasni sistem, te ljude i materijalna dobra. Također jedan od velikih rizika po sigurnost gasne infrastrukture, ali i općenito kritične infrastrukture u Bosni i Hercegovini, predstavlja činjenica da Bosna i Hercegovina, ali ni Federacija BiH, nemaju zakon o kritičnoj infrastrukturi, čime do današnjeg dana nisu ispunjene obaveze u pogledu reguliranja ove oblasti u skladu sa Direktivom Europske unije (EU) 2022/25571 iz 2022. godine. Ovo predstavlja temeljni i suštinski nedostatak u efikasnom upravljanju rizicima na kritičnoj infrastrukturu, pa samim tim i požarnim rizicima. Naročito imajući u vidu činjenicu da: „prijetnje po infrastrukturu imaju antropogene, strateške, organizacijske, materijalne, i tehničko-tehnološke posljedice. Štete koje mogu nastati usljed realizacije rizika sem što prouzrokuju velike materijalne troškove, utiču i na sam ugled organizacije“ (Gavrilović, 2023).

[1] Direktiva Europske unije (EU) 2022/2557 Europskog parlamenta i vijeća od 14.12.2022. godine o otpornosti kritičnih subjekata i o stavljanju izvan snage Direktive Vijeća 2008/114/EZ

Požarni rizici u procesu distribucije prirodnog gasa

Požarni rizici predstavljaju najopasnije rizike po kritičnu infrastrukturu za distribuciju gasa. Kada je u pitanju njihovo stvaranje i posljedično kreiranje iz neke druge opasnosti i rizika, posebno mjesto zauzima slijedećih 7 uzroka ili rizika:

1. Prirodne i druge nesreće koje kreiraju požarni rizik (poplava, klizište i sl.),
2. Curenje prirodnog gasa (u najvećoj mjeri nekontrolisano),
3. Neispravna gasna ili elektro instalacija ili tehnički sistemi koji ih štite,
4. Rizici kod održavanja gasnih instalacija i postrojenja (prilikom održavanja pojavljivanje iskre, otvoreni plamen u blizini, korištenje iskrećeg alata, upaljena cigareta i sl.),
5. Sabotaže, diverzije ili teroristički napadi na gasnoj infrastrukturi,
6. Nepravilnosti kod zapunjavanja i pražnjenja gasnog sistem prirodnim gasom (prekid dotoka gasa zbog raznih razloga, politički, ekonomski i sl.),
7. Nepravilnost u procesu postavljanja instalacija i neredovno održavanje istih (kod krajnjeg korisnika, prepravke, neispravni krajnji uređaji i sl.).

U svakom ovom segmentu, ljudski faktor u preduprjeđenju da ne dođe do prelaska požarnog rizika u stvarnu prijetnju, a kasnije i posljedicu, igra ključnu ulogu.

Mjere i aktivnosti koje poduzima distributer glavne gasne infrastrukture u cilju pametnog upravljanja požarnim rizicima

Baza svakog ozbiljnog posla na visokorizičnim i opasnim infrastrukturama je dosljedna, te kontinuirana primjena mjera zaštite od požara u 24 satnom režimu rada, sa posebnim osvrtom na primjenu dodatnih i posebnih mjera prilikom provođenja požarno visokorizičnih poslova u pogledu održavanja, sanacije, rekonstrukcije i izgradnje gasne mreže i postrojenja. Kada je u pitanju Kanton Sarajevo, gasna mreža Kantona Sarajevo ima dužinu od preko 1500 kilometara, na području cijelog Kantona u različitim smjerovima, različitog profila, a ova mreža je uvijek pod pritiskom. To znači da ispod Kantona Sarajevo imamo u svakom momentu visok rizik od od potencijalnog nastanka eksplozije i/ili požara, što uvijek nivo ozbiljnost diže na najviše mjesto na ljestvici. Pored propisa koje distributer gasa i upravljač ovim javnim dobrom (gasnim sistemom), Sarajevogas primjenjuje, on posjeduje visokokvalitetne kadrove koji su stručnjaci u oblasti mašinske, elektro, građevinske struke, zaštite na radu, zaštite od požara, te zaštite od prirodnih i drugih nesreća. Održavanje sistema u ispravnoj funkciji, njegova kontrola i održavanje su od presudnog značaja za sigurnu i pouzdanu distribuciju

gasa putem Gasnog sistema Kantona Sarajevo. Tu spada čitav niz preventivnih radnji:

- Nadzor i upravljanje gasnim sistemom, poseban nadzor nad parametrima pritiska gasa. Ova aktivnost se provodi putem Dispečerskog centra i putem ekipa na terenu, sa operativnošću 24/7.
- Odorizacija, dodavanje karakterističnog mirisa prirodnom gasu da bi se isti prepoznao u slučaju njegovog prisustva u prostoru gdje može u omjeru sa zrakom, formirati eksplozivnu smjesu.
- Redovno održavanje gasnih postrojenja, gasne mreže, provođenje nadzora nad radom ovlaštenih servisera, instalatera i projektanata unutrašnjih gasnih instalacija.
- Ugradnja sistema prevencije putem tehničke zaštite (sistemi aktivne zaštite od požara za dojavu dima i vatre, te sistemi aktivne zaštite od požara za dojavu prisustva zapaljivih gasova), kojima se pravovremeno i preventivno doznaje za prisustvo određenog rizika (dima, vatre, gasa), na mjestu i u količini koja može dovesti do posljedica.
- Tehnička i fizička zaštita gasnih postrojenja, poseban nadzor nad parametrima sigurnosti ovih postrojenja (fizička zaštita, vatrodojava, plinodojava, protuprovala, kontrola pristupa i videonadzor). Ova aktivnost se provodi putem Dojavnog-operativnog centra i putem mobilnih naoružanih ekipa na terenu, sa operativnošću 24/7. Predmetni centar posjeduje ovlaštenja i odobrenja izdate od strane Federalnog ministarstva unutrašnjih poslova i nadležnog kantonalnog ministarstva unutrašnjih poslova.
- Redovna, periodična *ad hoc* obuka vlastitih radnika za djelovanje u kriznim situacijama, izazvanih nekontrolisanim curenjem gasa, požarom ili eksplozijom, sa aspekta tehničko-tehnoloških mjera, preko mjera zaštite od požara, do mjera zaštite procesa redovnog snabdijevanja prirodnim gasom Kantona Sarajevo.
- Saradnja sa inspekcijskim organima sa nivo Kantona, Federacije i nivoa države BiH, u cilju kontrole, nadzora i pomoći distributeru da propisno i pravilno primjenjuje propise, tehnička pravila, standarde i pravila struke u svom radu.
- Podrška ovlaštenih pravnih lica za obavljanje poslova zaštite od požara, putem sistema ugovaranja.
- Protupožarna i protueksplozivna podrška lokalne profesionalne vatrogasne jedinice 24/7, sistemu rada i sigurnosti gasnog sistema Kantona Sarajevo.
- Pisane i slikovite smjernice putem znakova upozorenja, obavještenja i zabrana koji se nalaze na svim postrojenjima, na način da svim ljudima koji na bilo koji način dolaze u dodir ili susret sa gasnim postrojenjima,

daju jasne smjernice šta treba a šta ne treba raditi kada su u pitanju gasna postrojenja, sa aspekta zaštite od požara.

Na narednoj ilustraciji ćemo prikazati na koji način se odvija saradnja različitih subjekata i aktera sigurnosti, u cilju osiguranja pouzdane i sigurne distribucije gasa

Slika 1. Izvor: Sektor sigurnosti i općih poslova KJKP Sarajevogas d.o.o. Sarajevo, 2023. godina

Kao što i ilustracija prikazuje, distributer se primarno oslanja na vlastite kadrove i stručno osoblje koje posjeduje u redu vlastitih radnika. Kada zahtjevi i požarni rizici nadilaze kapacitete i nadležnosti distributera, isti se odmah (znači bez odlaganja) obraća eksternim pravnim osobama, organima i institucijama za podršku u oblasti upravljanje požarnim rizicima, i najveći dio aktivnosti se odvija u sferi prevencije. Ovaj sistem rada pokazuje važnost stručnosti i timskog rada u ovom poslovima zaštite od požara i zaštite od požarnih rizika, kroz javno-javno i javno-privatno partnerstvo. Ovaj pristup u aktuelnom trenutku daje rezultate, ali se uvijek iznova analizira u cilju obogaćivanja i proširenja saradnje, te pametnijeg i efikasnijeg upravljanja požarnim rizicima.

Zaključak

Gasna infrastruktura Kantona Sarajevo nije samo tehnički sistem podzemnih cijevi i postrojenja – ona je pulsirajući krvotok jedne urbane cjeline, temelj stabilnosti energetskog, ekonomskog i društvenog poretka. Njena sigurnost nije stvar rutinskog tehničkog održavanja, nego svakodnevne borbe protiv višeslojne strukture rizika – od fizičkih i tehnoloških, do pravnih, društvenih i strateških.

Upravljanje požarnim rizicima u kontekstu gasne infrastrukture zahtijeva daleko više od pukog ispunjavanja zakonskih normi. To je kontinuirani proces promišljenog balansiranja između prevencije i reakcije, između zakonodavnog vakuuma i stvarnih potreba sigurnosne prakse na terenu. Iako Kanton Sarajevo ima niz propisa koji se primjenjuju u regulaciji distribucije gasa, sistemska praznina koju ostavlja nepostojanje zakona o kritičnoj infrastrukturi – kako na nivou entiteta, tako i države – predstavlja ključnu slabost u lancu sigurnosti.

Uprkos institucionalnim izazovima, distributer gasa u Kantonu Sarajevo, KJKP Sarajevogas d.o.o., pokazuje visok nivo profesionalizma u prepoznavanju i upravljanju požarnim rizicima. Kroz operativni režim 24/7, obuku stručno-tehničkih kadrova, tehničku i fizičku zaštitu postrojenja, te široku mrežu saradnje s inspekcijskim organima, sigurnosnim institucijama i privatnim akterima, ovaj sistem ne samo da odgovara na rizike – on ih aktivno predviđa i predupređuje. U tom kontekstu, vidimo formu tzv. „žive sigurnosti“, gdje tehnika, zakon i ljudski faktor djeluju u sinergiji.

S druge strane, svakodnevna prijetnja od nelegalne gradnje, nestručnih radova trećih lica, i generalno nepostojanja optimalne spoznaje o značaju gasne mreže među građanima i institucijama, nameću potrebu za novim pristupima. Sigurnost gasne infrastrukture više se ne može promatrati kao izolovana tehnička oblast. Ona je sastavni dio koncepta „otporne zajednice“, gdje je svaki akter – od zakonodavca do građanina – odgovoran za sigurnost sistema koji u konačnici čuva normalan život građana, njihovu imovinu, poslove procese kompanija, te ono najvažnije zdravlje i živote ljudi.

U tom svjetlu, donošenje zakona o kritičnoj infrastrukturi u BiH i usklađivanje sa Direktivom EU 2022/2557 nisu samo evropske obaveze – one su egzistencijalni prioritet. Svaki dan bez tog zakona je dan sa više nepredvidivih rizika. Praksa Sarajevogasa može i treba poslužiti kao model drugim subjektima u BiH i regiji – ne samo po pitanju organizacije i tehničkog nadzora, već i po načinu na koji se sigurnost postavlja kao centralna vrijednost poslovanja.

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6) Uredba o snabdijevanju prirodnim gasom Kantona Sarajevo (Službene novine Kantona Sarajevo broj 22/16),
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FIRE RISK MANAGEMENT ON MAIN GAS CRITICAL INFRASTRUCTURE IN BOSNIA AND HERZEGOVINA THE GAS SYSTEM OF SARAJEVO CANTON

Professional article

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Abstract:

The importance of energy security in Southeast European countries, particularly in terms of the reliability and safety of energy supply, has consistently been a central concern of both national security and national economic policy. This issue has become even more prominent in light of increasing geopolitical risks, especially following the Russian Federation's war against Ukraine. This context is particularly relevant given that natural gas is predominantly supplied to Southeast Europe via routes originating in the Russian Federation.

This professional paper focuses on the micro-level context of Bosnia and Herzegovina, specifically on the country's largest gas infrastructure system—the gas distribution system of Sarajevo Canton. When it comes to gas infrastructure, fire hazards are among the primary risks, as they can lead to significant consequences including fires and explosions in gas facilities and the gas distribution network. In order to prevent such incidents, significant attention is given to implementing preventive and mitigation measures aimed at managing fire risks before they escalate into actual fire-related events. This implies that the gas distributor, in cooperation with the competent inspection authorities, exerts maximum effort to ensure the practical implementation of legal, technical, and technological regulations and standards specific to this highly specialized area of energy and safety. These activities are carried out continuously, 24/7.

Keywords*: fire protection, explosion protection, gas network, gas facilities, risks, risk management, prevention, legal compliance, standards, technical regulations.*

Introduction

In global strategic relations, gas infrastructure occupies a top position among national interests—not only for European Union member states, but also for other European countries that are not yet part of the EU, particularly Bosnia and Herzegovina. Exactly fifty years ago, Bosnia and Herzegovina embarked on a generational project to build a gas distribution network with the goal of mitigating air pollution in the capital city, Sarajevo. The aim was to ensure the supply of a reliable and environmentally friendly energy source, contributing to public health, optimal thermal energy production, environmental protection, and industrial development at the time.

In the 1990s, Sarajevo and the entire country were devastated by war. In addition to the tragic human toll, the gas infrastructure was severely affected—displaced and destabilized by underground detonations caused by explosive devices. Furthermore, part of the network was built or expanded during wartime, presenting a specific challenge for preserving and operating infrastructure that originates from that period.

Today, one of the greatest risks facing the gas infrastructure in Sarajevo Canton is illegal construction and unauthorized activities within the gas pipeline protection corridor. These actions pose a direct danger not only to those carrying out such works, but also to the wider population, property, and the gas system as a whole.

When addressing this topic, it is essential to frame risk management—and safety in general—within the context of contemporary challenges. As Kadić (2024) points out, "security and security sciences encompass many fields and require a comprehensive, multidisciplinary approach due to their diversity. This fact is especially evident in the 21st century, as the focus in the field of security increasingly shifts away from traditional interpretations and wartime operations."

Legal Framework, Technical Regulations, and Standards – Importance and Implementation

More than thirty years after gaining independence, Bosnia and Herzegovina still has not adopted a state-level gas law. Instead, regulations are applied at the entity or even lower administrative levels. Specifically, for Sarajevo Canton, the following legal instruments represent the core regulatory framework for the gas sector and infrastructure:

- Regulation on the Organization and Regulation of the Gas Industry Sector (Official Gazette of the Federation of BiH, No. 83/07),
- Rulebook on the Adoption and Implementation of Technical Regulations for the Design, Construction, Commissioning, Operation, and Maintenance of Natural Gas Facilities and Installations (Official Gazette of the Federation of BiH, No. 83/08),
- Regulation on Natural Gas Supply in Sarajevo Canton (Official Gazette of Sarajevo Canton, No. 22/16),
- Rulebook on Conditions for the Safe and Uninterrupted Distribution of Natural Gas in Distribution Systems with Pressure up to 16 bar (Official Gazette of Sarajevo Canton, No. 40/2017),
- Technical Rules,
- Standards,
- Internal procedures of the gas distributor.

In terms of safety—specifically fire protection—the following laws and documents are primarily referenced:

- Law on the Protection and Rescue of People and Material Goods from Natural and Other Disasters (Official Gazette of the Federation of BiH, Nos. 39/03, 22/06, and 43/10),
- Law on Fire Protection and Firefighting (Official Gazette of the Federation of BiH, No. 64/09),
- Sub-legal acts in the field of fire protection,
- Risk assessments and protection and rescue plans against natural and other disasters,
- Fire protection assessments and fire safety plans.

Strict implementation and consistent application of these laws, rules, standards, and documents ensure optimal safety and effective fire risk management. However, this is not always the case in practice—especially when third parties violate these regulations through improper work practices, thereby endangering the gas system, human lives, and material assets.

A particularly significant risk to the safety of gas infrastructure—and to critical infrastructure in Bosnia and Herzegovina in general—is the absence of a law on critical infrastructure, both at the state level and within the Federation of BiH. As a result, the country has yet to fulfill its obligation to regulate this area in accordance with the European Union Directive (EU) 2022/2557 from 2022. This legislative gap constitutes a fundamental weakness in the efficient management of risks associated with critical infrastructure, including fire risks.

This is especially concerning given the fact that "threats to infrastructure can have anthropogenic, strategic, organizational, material, and technical-technological consequences. The damages resulting from risk realization not only incur significant material costs, but also affect the reputation of the organization" (Gavrilović, 2023).

Fire Risks in the Natural Gas Distribution Process

Fire risks represent the most serious threats to critical infrastructure in the natural gas distribution sector. These risks can arise directly or as a consequence of other hazards, with the following seven causes or risk factors being particularly significant:

1. Natural and other disasters that create fire hazards (e.g., floods, landslides, etc.),
2. Uncontrolled leakage of natural gas,
3. Defective gas or electrical installations or malfunctioning safety systems,
4. Risks associated with maintenance of gas installations and facilities (e.g., occurrence of sparks, presence of open flame, use of spark-generating tools, smoking near installations),
5. Sabotage, diversion, or terrorist attacks targeting gas infrastructure,
6. Improper procedures during gas system pressurization or depressurization (e.g., gas supply interruptions due to political, economic, or other causes),
7. Improper installation and irregular maintenance of internal gas systems (e.g., unprofessional modifications, faulty end-user appliances).

In all of these areas, the human factor plays a key role in preventing fire risks from escalating into actual threats and ultimately causing harmful consequences.

Measures and Activities Undertaken by the Distributor of the Main Gas Infrastructure for Smart Fire Risk Management

The foundation of any serious operation involving high-risk and hazardous infrastructures lies in the consistent and continuous implementation of fire protection measures around the clock, with special attention given to additional and specific measures during fire high-risk operations such as maintenance, repairs, reconstruction, and construction of the gas network and facilities.

Regarding the Canton of Sarajevo, the gas network extends over 1,500 kilometers across the entire canton, covering various directions and profiles, and is continuously under pressure. This inherently creates a constant high risk of potential explosion and/or fire incidents beneath the territory of Canton Sarajevo, which elevates the seriousness of safety management to the highest priority.

In addition to the regulations governing gas distributors and the operators of this public asset (the gas system), Sarajevogas employs highly qualified personnel who are experts in mechanical, electrical, and civil engineering disciplines, occupational safety, fire protection, as well as natural and other disaster protection fields. Maintaining the system in proper operational condition, its continuous monitoring, and upkeep are crucial for the safe and reliable distribution of gas through the Gas System of Canton Sarajevo. This includes a broad range of preventive measures:

- **Monitoring and control of the gas system**, with special attention to gas pressure parameters. This activity is carried out through the Dispatch Center and field teams operating 24/7.
- **Odorization** – the addition of a characteristic smell to natural gas to enable its detection in case it leaks into an area where it could form an explosive mixture with air.
- **Regular maintenance** of gas facilities and the network, including supervision of authorized service providers, installers, and designers of internal gas installations.
- **Installation of prevention systems through technical protection**, such as active fire protection systems for smoke and flame detection and active gas detection systems. These enable timely and preventive detection of hazards (smoke, fire, gas) at levels and locations that could lead to adverse consequences.
- **Technical and physical protection of gas facilities**, including close monitoring of safety parameters (physical protection, fire alarm, gas detection, anti-burglary measures, access control, and video surveillance). This is managed through the Alarm and Operations Center and mobile armed teams operating 24/7. This center holds official authorizations issued by the Federal Ministry of Internal Affairs and the relevant cantonal ministries.
- **Regular and ad hoc training** of in-house personnel for crisis response caused by uncontrolled gas leaks, fires, or explosions, covering technical and technological measures, fire protection protocols, and maintaining uninterrupted gas supply to the Canton.

- **Collaboration with inspection authorities** at the cantonal, federal, and state levels to ensure proper enforcement and application of regulations, technical rules, standards, and best practices in daily operations.
- **Support of authorized legal entities** for fire protection tasks via contractual engagement.
- **Fire and explosion protection support** from the local professional firefighting unit operating 24/7, ensuring the safety and operational continuity of the gas system in Canton Sarajevo.
- **Clear written and visual guidelines** through warning signs, notices, and prohibitions displayed on all facilities. These provide all personnel and visitors interacting with gas installations with explicit instructions on what actions to take or avoid concerning fire protection.

The subsequent illustration will demonstrate how various entities and actors collaborate to ensure the reliable and safe distribution of gas.

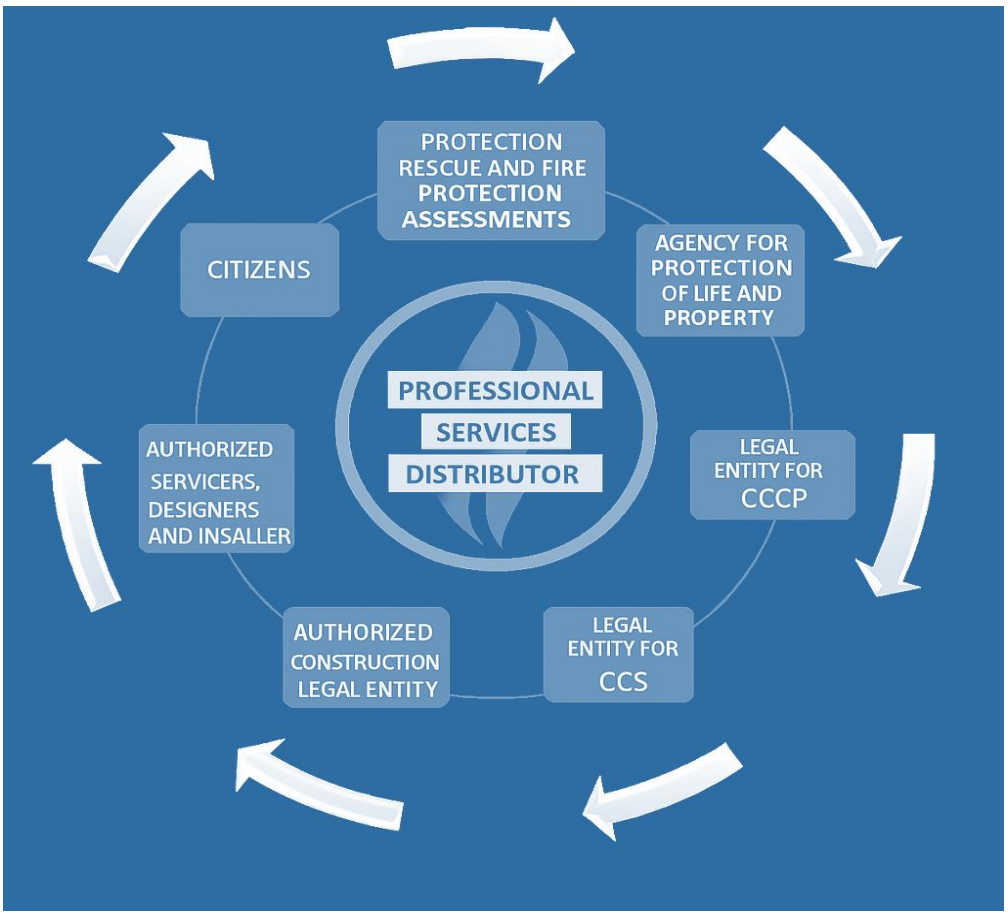

Figure 1. Source: Security and General Affairs Sector, Public Utility Company Sarajevogas d.o.o. Sarajevo, 2023.

As illustrated, the distributor primarily relies on its own qualified personnel and expert staff within its workforce. When demands and fire risks exceed the capacities and jurisdiction of the distributor, they immediately (without delay) engage external legal entities, authorities, and institutions to support fire risk management. The majority of activities take place within the realm of prevention. This operational model underscores the importance of expertise and teamwork in fire protection and fire risk management, through both public-public and public-private partnerships. While this approach currently delivers results, it is continually analyzed to enhance and expand cooperation for smarter and more efficient fire risk management.

Conclusion

The gas infrastructure of Canton Sarajevo is not merely a technical system of underground pipes and facilities — it is the pulsating bloodstream of an urban entity, the foundation of the energy, economic, and social order's stability. Its safety is not a matter of routine technical maintenance but a daily battle against a multilayered structure of risks — from physical and technological, to legal, social, and strategic.

Managing fire risks in the context of gas infrastructure demands far more than mere compliance with legal norms. It is a continuous process of thoughtful balancing between prevention and response, between legislative gaps and the actual needs of safety practice on the ground. Although Canton Sarajevo has numerous regulations governing gas distribution, the systemic void created by the absence of a critical infrastructure law — both at the entity and state levels — represents a key weakness in the safety chain.

Despite institutional challenges, the gas distributor in Canton Sarajevo, Public Utility Company Sarajevogas d.o.o., demonstrates a high level of professionalism in recognizing and managing fire risks. Through a 24/7 operational regime, training of technical experts, technical and physical protection of facilities, and an extensive network of cooperation with inspection bodies, security institutions, and private actors, this system not only reacts to risks — it actively anticipates and prevents them. In this context, we observe a form of so-called "living safety," where technology, legislation, and the human factor operate synergistically.

On the other hand, the daily threat of illegal construction, unqualified work by third parties, and a general lack of awareness about the significance of the gas

network among citizens and institutions call for new approaches. Gas infrastructure safety can no longer be viewed as an isolated technical issue. It is an integral part of the concept of a "resilient community," where every actor — from lawmakers to citizens — shares responsibility for the safety of the system that ultimately protects citizens' normal lives, their property, business processes, and, most importantly, their health and lives.

In this light, the enactment of a critical infrastructure law in Bosnia and Herzegovina and harmonization with EU Directive 2022/2557 are not only European obligations — they are existential priorities. Every day without such legislation is a day with increased unpredictable risks. The practice of Sarajevogas can and should serve as a model for other entities in BiH and the region — not only in terms of organization and technical supervision but also in how safety is established as a core business value.

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