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IMPLEMENTATION OF AN INTEGRATED SYSTEM OF INDUSTRIAL SECURITY MANAGEMENT WITHIN AN ENERGY COMPANY OF NATIONAL STRATEGIC INTEREST

CRISTINA SUCIU (PUPAZA)[1], NICOLAE DANIEL FITA[2], EMILIA GRIGORIE[3], FLORIN GABRIEL POPESCU[4], DRAGOS PASCULESCU[5], ALINA DANIELA HANDRA[6], ANDREI CRISTIAN RADA[7], RAZVAN SLUSARIUC[8]

Abstract: The increasing occurrence of cases of industrial insecurity in the context of national, regional and NATO security, makes this paper to be of great importance and topicality, knowing very well that the security, protection and safety strategies of strategic energy companies of national interest must be implemented, due to the interdependencies between the related critical systems. Knowing very well that industrial security is endangered by various vulnerabilities, threats, risks and dangers within strategic energy companies of national strategic interest, the authors propose the need to implement an integrated system of industrial security in the context of ensuring national security.

Keywords: Integrated Management, Industrial Security, Energy Company, National Security.

1. THE CONCEPT OF INTEGRATED MANAGEMENT OF INDUSTRIAL SECURITY

Because the national industry, through its industrial objectives, can have major social and economic effects on society, through jobs, workers, goods, services and infrastructure, the issue of industrial security becomes a fundamental condition of

[1] *Ph.D., Student, Ec., University of Petrosani, cristina_suciu27@yahoo.com*
[2] *Ph.D., Lecturer Eng., University of Petrosani, daniel.fita@yahoo.com*
[3] *Ph.D., Student, Eng., University of Petrosani, emilia_grigorie@yahoo.com*
[4] *Ph.D., Lecturer Eng., University of Petrosani, floringabriel82@yahoo.com*
[5] *Ph.D., Associate Prof., Eng., University of Petrosani, pdragos_74@yahoo.com*
[6] *Ph.D., Assistant, Eng., University of Petrosani, handra.alina@yahoo.com*
[7] *Ph.D., Assistant, Eng., University of Petrosani, radka_kysto2008@yahoo.com*
[8] *Ph.D., Lecturer Eng., University of Petrosani, Eng.,razvansir@yahoo.com*

security and economic efficiency in order to increase national economic security., according to fig.1 [3], [5], [8], [29].

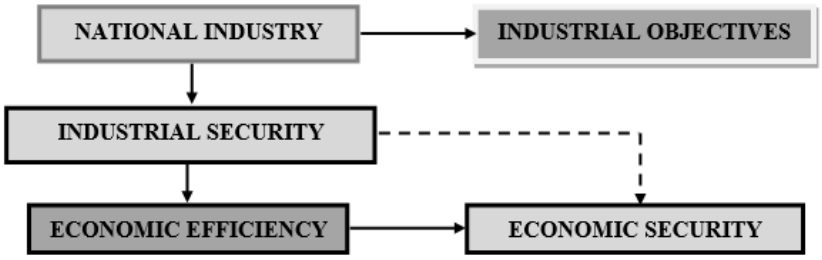

Fig.1. Industrial security – a fundamental component of efficiency and economic security

It is proposed to introduce the concept of Integrated Management of Industrial Security, by implementing in the package the following elements that identify insecurity and generate security [2], [4], [7], [20], [24], according to fig. 1.

1. **Risk Management**:
   a) Risk planning;
   b) Risk identification by S.W.O.T.;
   c) Risk analysis;
   d) Establishing risk approach strategies;
   e) Risk monitoring and control.

2. **Critical Infrastructure Security and Protection Management:**
   a) Preparation of the Security Plan for the critical infrastructure operator;
   b) Measures and strategies for the protection and security of national or European critical infrastructure.

3. **Occupational Health and Safety Management**:
   a) Assessment of the risks of occupational injury and illness;
   b) Assessment (auditing) with the legal provisions and other provisions to which the entity subscribes.

4. **Anti-Bribery Management:**
   a) Certification;
   b) Implementation.

5. **Business Continuity Management:**
   a) Certification;
   b) Implementation.

They must ensure the total security of industrial objectives from all points of view and contribute at all times to the rapid restoration of activity, by increasing resilience, in the following situations [1], [6], [10], [12], [16], [22]: Natural disasters

(earthquakes, floods, explosions, fires, etc.); National crises; Special situations; Acts of terrorism; Sabotage; Thefts; Pollution; War, etc.

The critical situations listed above aim at the rapid restoration of production capacity in order to carry out the normal activity of economic activity generating efficiency and economic security [9], [11], [15], [17], [26].

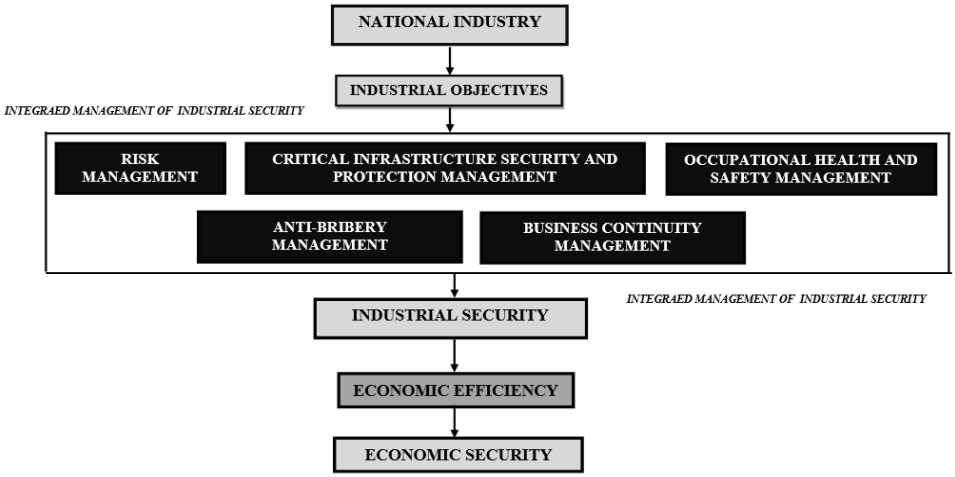

Fig.2. Integrated Management of Industrial Security

Integrated Management of Industrial Security (Fig. 2) include the following 5 stages [13], [18], [21], [25]:

1. **Risk identification by critical analysis (technical) S.W.O.T.:**
   a) Identification of vulnerabilities;
   b) Identification of threats;
   c) Identification of hazards.
2. **Preparation of the national or european Security Plan of the Critical Infrastructure Operator:**
   a) Identification of plausible risk scenarios that threaten the security of industrial objectives;
   b) Assessment of industrial and national security risks;
   c) Development of measures and strategies for the protection and security of national and european critical infrastructure.
3. **Assessment and audit of Occupational Health and Safety risks:**
   a) Assessing the risks of occupational injury and illness by calculating the overall risk level for each place of work and developing the Protection and Prevention Plan.;
   b) Auditing with legal and other provisions to which the entity subscribes by calculating the general compliance level and the level of general security.
4. **Certification and implementation of the ISO 37001: 2016 Standard - Anti-Bribery Management;**

5. Certification and implementation of ISO Standard 22301: 2019 - Business Continuity Management.

The structure of Integrated Management of Industrial Security is based on the following results from the analysis, identification and audit of industrial objectives [14], [19], [23], [: Development of security strategies; Identified threats; Tolerance and minimization of industrial and occupational health and safety risks identified; Identified vulnerabilities; Identified critical infrastructures; Insecurity generating elements; The elements of bad intentions (ill-will).

2. IMPLEMENTATION OF THE SYSTEM OF INTEGRATED MANAGEMENT OF INDUSTRIAL SECURITY AT AN ENERGY COMPANY OF NATIONAL STRATEGIC INTEREST

2.1. Elaboration of the Integrated Management Plan of Industrial Security at the National Power Grid – NPG Transelectrica Romania

INTEGRATED MANAGEMENT PLAN OF INDUSTRIAL SECURITY	
NATIONAL / EUROPEAN CRITICAL INFRASTRUCTURE POWER OBJECTIVES FROM NPG TRANSELECTRICA	
Stage 1 – Critical analysis – S.W.O.T. [11]	
STRENGHTS	**WEAKNESSES**
a) The natural monopoly character of the activity of transmission and system operator – TSO and the positive impact on the risk management; b) High level of technical expertise of the staff; c) Important progress in the process of rehabilitation and modernization of the infrastructure of the National Power Grid – NPG; d) Moderate degree of indebtedness for financing investments; e) The legacy of previous decades - a high, very high and ultra high voltage network that carried over 90 TWh per year; f) Membership in ENTSO-E, formation and integration of regional electricity markets and formation of the single electricity market; g) Dualist management system with the Supervisory Board and the Board of Directors and application of the provisions of GEO no. 109/2011; h) The introduction of Law 255/2013 on expropriation for the cause of public utility, necessary to achieve objectives of national, county and local interest; i) Presence on the capital market; j) Trading of TEL shares on Bucharest Stock Exchange.	a) Obsolete or overlapping network elements that have not yet been included in rehabilitation and modernization programs; b) The high value of own technological consumption – OTC with a tendency to increase due to the location of renewables, as a physical percentage, OTC is significantly higher than the regulated one and the real power flows are not likely to help reduce OTC; c) The reduced efficiency of controllable expenditures, especially in the area of maintenance and capital repairs, amid the diminished investment effort in recent years; d) Insufficient financial performance; e) The realized return on capital is still significantly lower than the cost of capital; f) Poor performance than similar TSO listed companies; g) The instability of the management staff and of the organizational formulas with impact on the elaboration of coherent strategies for the development of Transelectrica and the adaptation to the new conditions of the economic environment;

	h) The previously assumed strategies regarding the decreasing evolution of the average number of staff have not been implemented; i) The negative effects of the budgetary constraints, generated in part by the economic crisis, on the financing capacity, accentuated by the fact that Transelectrica manages (does not hold) the assets of NPG; j) Insufficient level of financial expertise of the staff and the partial introduction of a computerized management system; k) The low efficiency of the relationship with the Smart and Teletrans subsidiaries is mainly due to the frequent changes in the group's management.
OPPORTUNITIES	**THREATS**
a) European strategy and legislation, which in principle should be seen as an opportunity - the requirements of Legislative Package 3 on the certification, organization and operation of TSOs; b) Posibilitatea definirii unor programe sectoriale prin care să se aloce fonduri structurale (ajutor de stat pentru activități de serviciu public) pentru realizarea de noi active de transport necesare atingerii unor obiective naționale și pan-europene, cum ar fi integrarea producției necontrolabile din surse regenerabile (Connecting Europe); c) The possibility of defining sectoral programs through which to allocate structural funds (state aid for public service activities) for the realization of new transport assets necessary to achieve national and pan-European objectives, such as the integration of uncontrollable production from renewable sources (Connecting Europe); d) Possible new interconnection infrastructure projects in public private partnership – PPP; e) Development of new business (unregulated regime).	a) High unforeseen electricity costs; b) The decreasing trend of domestic energy consumption (against the background of the prolongation of the economic crisis) with a negative impact on revenues and tariffs for transport and system services; c) Delays in updating the national energy strategy; d) Late application of the European legislative framework both as a transposition into national law, including at the level of secondary legislation, and as implementation (delay in carrying out the certification process) and risks of infringement; e) The structure of the support scheme for renewable energy sources that puts pressure on the company both in investment (connection to NPG) and in operation (with emphasis on the balancing market); f) Vulnerabilities in the electricity production sector (coal area, increase in intermittent production, delay of large investment projects of state-owned companies); g) Changing the centers of gravity of electricity production but even of consumption; h) In Bucharest, obsolete CHPs no longer produce as before and Bucharest is no longer an energy exporter to the rest of the country, becoming an importer, requiring the reconfiguration of the high voltage network, but also the closure of a transmission network ring in the development of consumption in around Bucharest; i) The emergence of electricity producers from renewable energy sources in southeastern Romania, with uncontrollable production,

	leads to reduced production in the southwest and a change in power flows in NPG, with the modification of OTC and threats of congestion when crossing the Danube from Dobrogea - significant network reinforcements are needed; j) Insufficient perspective on the existence and availability of technological system services; k) Different investment rates between new sources of electricity generation using renewables and the development of NPG which should take over and transport this uncontrollable production; l) Insufficient commercial and financial discipline in the electricity markets, non-payment of issued bills and recovery of commercial claims in court; m) Reducing Romania's attractiveness for the investment environment; n) Difficulties of the regulatory framework: insufficient financial balance of the administration of the support scheme for high-efficiency cogeneration and delays in recognizing the costs of technological system services in tariff; o) Transport tariff methodology: insufficient solution of the OTC problem - financing of investments from the transport tariff; p) Deterioration of the energy vocational education system.
Stage 2 – Elaboration of the Security Plan of National / European Critical Infrastructure Operator [11]	

SECURITY PLAN AT OPERATOR – S.P.O.
NCI / ECI: POWER OBJECTIVES WITHIN NPG TRANSELECTRICA
400/220/110/20 kV POWER SUBSTATION

DESCRIPTION OF THE WORK SYSTEM WITHIN 400/220/110/20 kV POWER SUBSTATION

General presentation:

Location:
- The 400/220/110/20 kV xxx power substation is located in the village/commune/locality xxx, county xxx, belonging to the Center for the Operation of Electric Transmission Networks xxx - Territorial Transport Unit xxx;
- The 400/220/110/20 kV xxx power substation is/is not an important node for the National Power System;
- The 400/220/110/20 kV xxx power station has/does not have an international interconnection to the European Union Energy System – ENTSO-E.

Organizational structure:x substation manager(s); x shift leaders; x assistant shift leaders; x workers - electrical field (operational staff).

Managed power ebjectives:
- The Territorial Transport Unit xxx carries out its activity on the electric power installations of electricity located in the counties: xxx; xxx; xxx;
- The activity is organized in x centers of exploitation: CE xxx; CE xxx; CE xxx;
- The volume of installations consists of: x power substations with nominal voltages in the range of 20 kV - 110 kV - 220 kV - 400 kV: xxx; xxx; xxx.

Presentation of the 400/220/110/20 kV power substation:

Presentation of the 400 kV power substation:
- The 400 kV power substation has a wiring diagram type xxx.;
- Power cells: x busbars xxx: x OHL (xxx, xxx, xxx); x AT 400/220/110/20 kV; x coupling (transverse/longitudinal/long-transverse); x MVAr compensation coil; x busbar measuring; discharge cells;
- Electrical equipment related to cells: AT/T type xxx, transformation ratio xxx; x switches type xxx; x separators type xxx; x current transformers type xxx; x voltage transformers type xxx; x discharge type xxx.

Presentation of the 220 kV power substation:
- The 220 kV power substation has a wiring diagram type xxx.;
- Power cells: x busbars xxx: x OHL (xxx, xxx, xxx); x AT 220/110/20 kV; x coupling (transverse/longitudinal/long-transverse); x MVAr compensation coil; x busbar measuring; discharge cells;
- Electrical equipment related to cells: AT/T type xxx, transformation ratio xxx; x switches type xxx; x separators type xxx; x current transformers type xxx; x voltage transformers type xxx; x discharge type xxx.

Presentation of the 110 kV power substation:
- The 110 kV power substation has a wiring diagram type xxx.;
- Power cells: x busbars xxx: x OHL (xxx, xxx, xxx); x AT 110/20 kV; x coupling (transverse/longitudinal/long-transverse); x MVAr compensation coil; x busbar measuring; discharge cells;
- Electrical equipment related to cells: AT/T type xxx, transformation ratio xxx; x switches type xxx; x separators type xxx; x current transformers type xxx; x voltage transformers type xxx; x discharge type xxx.

Presentation of the 20 kV power substation:
- The 20 kV power substation has a wiring diagram type xxx.;
- Power cells: x busbars xxx: x OHL (xxx, xxx, xxx); x AT 20/0,4 kV; x coupling (transverse/longitudinal/long-transverse); x MVAr compensation coil; x busbar measuring; discharge cells;
- Electrical equipment related to cells: AT/T type xxx, transformation ratio xxx; x switches type xxx; x separators type xxx; x current transformers type xxx; x voltage transformers type xxx; x discharge type xxx. [4]

RISK SCENARIO IDENTIFICATION:TERRORIST ATTACK → BLACK-OUT
RISC SCENARIO EVALUATION

RISK SCENARIO ***TERRORIST ATTACK → BLACK-OUT***	
Causes: - explosions following a terrorist attack followed by fires; - non-compliance with fire safety regulations; - lack of training / poor training of the staff of the Critical Infrastructure Protection Management; - lack of specialized Fire Protection staff; - lack of physical security personnel; - cyber attacks; - insecurity of hardware systems; - software systems insecurity; - the insecurity of the secret data transmission systems of the critical infrastructures; - lack of specialized cyber security personnel; - insecurity of SCADA (Supervisory Control and Data Acquisition) systems; - operating with insecure and/or non-performing programs; - insecurity of communications with Territorial / National Energy Dispatcher and between cybersecurity responsibles; - lack of cyber investment.	**Effects:** - possible deaths; - possible accidents with serious consequences; - fires; - access to secret informations about National Power System by unauthorized persons; - use of secret informations about the National Power System for military or terrorist purposes; - untimely disconnection of remotely controlled energy equipment by hackers; - enormous material damage due to lack of electricity; - enormous material damage resulting from the interdependence of other systems; - the possibility of a local, regional or national blackout; - energy-economic collapse; - crises.

a) Determining the probability

The following probability scale was adopted to determine the probability of occurrence [27], [28]:

LEVEL/SCORE ASSOCIATED		**DEFINITION OF PROBABILITY**	**PERIOD**
	1. Very Low	It has a very low probability of occurring. Normal measures are required to monitor the progress of the event.	**over 13 years**
	2. Low	The event has a low probability of occurring. Efforts are being made to reduce the likelihood and / or mitigation of the impact produced.	**10 – 12 years**
X	**3. Medium**	The event has a significant probability of occurring. Significant efforts are needed to reduce the	**7 – 9 years**

		likelihood and / or mitigate of the impact produced.	
	4. High	The event has a probability of occurring. Priority efforts are needed to reduce the likelihood of and / or mitigate of the impact produced.	**4 – 6 years**
	5. Very high	The event is considered imminent. Immediate and extreme measures are required to protect the objective, evacuation to a safe location if the impact requires it.	**1 – 3 years**

b) Determining the severity (gravity) of the consequences of the proposed scenario

LEVEL/SCORE ASSOCIATED		SEVERITY (GRAVITY) CONSEQUENCES
	1. Very Low	The event causes a minor disruption to the activity, without material damage.
	2. Low	The event causes minor property damage and limited business disruption.
	3. Medium	Personnel injury, and/or certain loss of equipment, utilities, and service delays.
	4. High	Serious personnel injury, significant loss of equipment and facilities, delays and/or interruption of service provision.
X	**5. Very high**	The consequences are catastrophic resulting in deaths and serious injuries to personnel, major loss of equipment, installations and facilities and the cessation of service provision.

c) Risk level calculation

PROBABILITY						
	Very high 5					
	High 4					
	Medium 3					**Scenario BLACK-OUT**
	Low 2					
	Very Low 1					
	0	**Very Low 1**	**Low 2**	**Medium 3**	**High 4**	**Very high 5**
-	**SEVERITY/GRAVITY CONSEQUENCES**					

The calculated risk is 15 (probability 3 x severity 5)	**CALCULATED RISK LEVEL**

Risk level is: HIGH RISK	LEVEL	SCORES
	Very Low	1 – 3
	Low	4 – 6
	Medium	7 – 12
	High	13 – 16
	Very high	17 – 25

d) Recalculating the severity (gravity) of the consequences

LEVEL/SCORE ASSOCIATED		SEVERITY (GRAVITY) CONSEQUENCES
	1. Very Low	The event causes a minor disruption to the activity, without material damage.
	2. Low	The event causes minor property damage and limited business disruption.
	3. Medium	Personnel injury, and/or certain loss of equipment, utilities, and service delays.
X	4. High	Serious personnel injury, significant loss of equipment and facilities, delays and/or interruption of service provision.
	5. Very high	The consequences are catastrophic resulting in deaths and serious injuries to personnel, major loss of equipment, installations and facilities and the cessation of service provision.

e) Level of risk after reduction measures have been applied

PROBABILITY						
	Very high 5					
	High 4					
	Medium 3				Scenario BLACK-OUT	
	Low 2					
	Very Low 1					
	0	Very Low 1	Low 2	Medium 3	High 4	Very high 5
SEVERITY/GRAVITY CONSEQUENCES						

The calculated risk is 12 (probability 3 x severity 4) Risk level is: MEDIUM RISK	CALCULATED RISK LEVEL	
	LEVEL	SCORES
	Very Low	1 – 3
	Low	4 – 6
	Medium	7 – 12

	High	**13 – 16**
	Very high	**17 – 25**

Stage 3 – Assessment and audit in terms of Occupational Health and Safety Risks [11]

ACTIVITY ORGANIZATION OF OCCUPATIONAL HEALTH AND SAFETY

- Activity organization of Occupational Health and Safety – OHS is carried out within the Compartment xxx;
- Within this compartment there is a responsible (specialist) in the field of OHS, together with the occupational medicine doctor;
- The OHS Committee is also organized, which is constituted by: president - the branch director; members - representatives proposed by the branch union; the occupational medicine doctor in the branch; secretary - specialist / expert / assessment in terms of OSH.

Assessment of the risks of occupational injury and illness at a power substation 400/220/110/20 kV

Global risk level assessment

The global risk level of the power substation is calculated as a weighted average of the risk level determined for each workplaces analyzed in the power substation.

$$N_g = \frac{\sum_{p=1}^{n} r_p \cdot N_{rp}}{\sum_{p=1}^{n} r_p} \quad (1)$$

where
Ng *= global risk level of the power substation;*
rp *= workplace rank p, equal to the value of the worlplace risk level;*
n *= number of worlplaces;*
Nrp *= global risk level of workpace.*

Global risk levels, determined for each worlplace at the 400/220/110/20 kV power substation are generally the following:

No.	WORKPLACE	RISK LEVEL (N_{rp})
1	OPERATIONAL SERVICE: 400 kV, 220 kV, 110 kV	X
2	OPERATIONAL SERVICE: 20 kV	X
3	MAINTENANCE OF PRIMARY CIRCUITS: 400 kV, 220 kV, 110 kV	X
4	MAINTENANCE OF PRIMARY CIRCUITS: 20 kV	X
5	MAINTENANCE OF SECONDARY CIRCUITS 20 kV – PRAM	X

DESCRIPTION OF THE WORK SYSTEM

1. Means of production:

- 400 kV power substation: *x busbars xxx:x OHL cells (xxx, xxx, xxx);x AT 400/220/110/20 kV cells; x coupling cells (transversal/longitudinal/longo-transversal);x compensation coil cells x MVAr;x mesuring busbars cells; x discharge cells;etc.;*
- 220 kV power substation: *x busbars xxx:x OHL cells (xxx, xxx, xxx);x AT 220/110/20 kV cells; x coupling cells (transversal/longitudinal/longo-transversal);x compensation coil cells x MVAr;x mesuring busbars cells; x discharge cells;etc.;*
- 110 kV power substation: *x busbars xxx:x OHL cells (xxx, xxx, xxx);x AT/T 110/20 kV cells; x coupling cells (transversal/longitudinal/longo-transversal);x compensation coil cells x MVAr;x mesuring busbars cells; x discharge cells;etc.;*
- 20 kV power substation: *x busbars xxx:x OHL cells (xxx, xxx, xxx);x AT/T 20/0,4 kV cells; x coupling cells (transversal/longitudinal/longo-transversal);x compensation coil cells x MVAr;x mesuring busbars cells; x discharge cells;etc.;*
- system of internal services at alternativ and direct current;
- systems of control, protection and automation;
- systems of cables;
- power plants – discharge on 20 kV;
- building, canals of cables;
- protective equipment and devices.

Risk factors specific to the means of production:

- *mechanical risk* (falling from the same level, slipping or tripping, explosions of equipment with a lifetime exceeded, falls from a height);
- *electric risk* (direct contact with electrical installations);
- *thermal risk* (burns due to electric arc).

2. Workload:

According to the operating regulations, the duties of the operational staff are as follows:

- performing the delivery-receiving operations of the team work;
- supervision activity;
- control activity;
- the activity of executing the maneuvers.

Risk factors specific to the workload*:*

- *psychic stress in the 400 kV, 220 kV, 110 kV, 20 kV power substations, when installing shortcircuits by hand.*

3. Performer (executor):

The following persons work in the power substation: x power substation manager (s) (engineer); x shift leaders; x assistant shift leader.

Risk factors specific to the performer (executor):

- *wrong action:* incorrect identification of the installation and non-verification of the lack of voltage, when mounting the shortcircuits; non-compliance with neighboring

distances with risk of electric shock by direct contact; uncheck the voltage before installing the shortcircuits;

- *omissions:* omission of operations during maneuvers, with risk of burns caused by electric arc, when closing the earthing knives or mounting the mobile shortcircuits without checking the lack of voltage; non-use and / or non-verification of personal protective equipment and / or electrical insulating means and devices.

4. Work environment:

The operative service personnel carry out their activity in the control room, in the outdoor power substations of 400 kV, 220 kV, 110 kV and 20 kV.
The specificity of the workload requires the development of exploitation and control activities regardless of climatic conditions.
As a result, the main risk factor for the work environment is air temperature and exposure to high or low temperatures during work.

Risk factors specific to the work environment:

- *physical risk factors:* exposure to adverse weather conditions (low / high temperatures, rain, snow, drafts) during the inspection of installations;

CALCULATION OF THE GLOBAL RISK LEVEL

1. Global risk level for workplace: OPERATIONAL SERVICE: 400 kV, 220 kV, 110 kV

$$N_{400kV-110kV} = \frac{\sum_{i=1}^{7} R_i \cdot r_i}{\sum_{i=1}^{7} r_i} = \frac{2\cdot(1\cdot1)+2\cdot(3\cdot3)+3\cdot(4\cdot4)}{2\cdot1+2\cdot3+3\cdot4}\frac{68}{20} = 3{,}4 \quad (2)$$

2. Global risk level for workplace: OPERATIONAL SERVICE: 20 kV

$$N_{20kV} = \frac{\sum_{i=1}^{11} R_i \cdot r_i}{\sum_{i=1}^{11} r_i} = \frac{11\cdot(3\cdot3)}{11\cdot3} = \frac{99}{33} = 3{,}00 \quad (3)$$

3. Global risklevel for workplace: MAINTENANCE OF PRIMARY CIRCUITS: 400 kV, 220 kV, 110 kV

$$N_{MENT.EP400/220kV} = \frac{\sum_{i=1}^{14} R_i \cdot r_i}{\sum_{i=1}^{14} r_i} = \frac{1\cdot(1\cdot1)+3\cdot(2\cdot2)+8\cdot(3\cdot3)+2\cdot(4\cdot4)}{1\cdot1+3\cdot2+8\cdot3+2\cdot4} = \frac{101}{39} = 2{,}58 \quad (4)$$

4. Global risklevel for workplace: MAINTENANCE OF PRIMARY CIRCUITS: 20 kV

$$N_{MENT.EP20kV} = \frac{\sum_{i=1}^{16} R_i \cdot r_i}{\sum_{i=1}^{16} r_i} = \tag{5}$$

$$= \frac{3\cdot(2\cdot 2)+2\cdot(3\cdot 3)+2\cdot(4\cdot 4)+4\cdot(5\cdot 5)+5\cdot(6\cdot 6)}{3\cdot 2+2\cdot 3+2\cdot 4+4\cdot 5++5\cdot 6} = \frac{342}{70} = 4{,}8$$

5. Global risk level for workplace: MAINTENANCE OF PRIMARY CIRCUITS – PRAM

$$N_{EP} = \frac{\sum_{i=1}^{17} R_i \cdot r_i}{\sum_{i=1}^{17} r_i} = \frac{13\cdot(3\cdot 3)+3\cdot(2\cdot 2)}{13\cdot 3+3\cdot 2} = \frac{129}{45} = 2{,}87 \tag{6}$$

GLOBAL RISK LEVEL OF THE 400/220/110/20 kV POWER SUBSTATION

The global risk levels determined for each workplace in the 400/220/110/20 kV power substation are as follows:

No.	WORKPLACE	RISK LEVEL (N_{rp})
1	**OPERATIONAL SERVICE: 400 kV, 220 kV, 110 kV**	**3,4**
2	**OPERATIONAL SERVICE: 20 kV**	**3**
3	**MAINTENANCE OF PRIMARY CIRCUITS: 400 kV, 220 kV, 110 kV**	**2,58**
4	**MAINTENANCE OF PRIMARY CIRCUITS: 20 kV**	**4,8**
5	**MAINTENANCE OF SECONDARY CIRCUITS 20 kV – PRAM**	**2,87**

The global risk level of the 400/220/110/20 kV power substation is:

$$N_{rg} = \frac{\sum_{p=1}^{n} r_p \cdot N_{rp}}{\sum_{p=1}^{n} r_p} = \tag{7}$$

$$= \frac{(3{,}4\cdot 3{,}4)+(3\cdot 3)+(2{,}58\cdot 2{,}58)+(4{,}8\cdot 4{,}8)+(2{,}87\cdot 2{,}87)}{3{,}4+3+2{,}58+4{,}8+2{,}87} = \frac{49{,}48}{16{,}65} = 2{,}97$$

$$N_{rg-statie} = 2{,}97$$

Assessment (auditing) of compliance with legal and other provisions at a 400/220/110/20 kV power substation

Program for assessing (auditing) compliance with legal and other provisions

GENERAL LEVEL OF COMPLIANCE

Sheet Code	Name	Scores		Level of compliance
		Maximum (PM)	Obtained (PO)	
A	**Obligations of the employer**	168	168	**100 %**
B	**Workers' rights and obligations**	48	47	**97,91 %**
		TOTAL		**NC_g**
		216	**215**	**99,53 %**

GENERAL LEVEL OF COMPLIANCE

Sheet Code	Name	Scores		Level of compliance
		Maximum (PM)	Obtained (PO)	
C. General provisions				
C.1	Minimum provisions at OHS	300	300	100 %
C.2	Minimum safety and health provisions for sign at work	90	90	100 %
C.3	Minimum safety and health provisions for use equipment by workers	120	120	100 %
C.4	Minimum safety and health provisions for use of display screen equipment	27	27	100 %
C.5	Minimum safety and health provisions for use of personal protective equipment by workers at work	18	18	100 %
C.14	Minimum safety and health provisions regarding the exposure of workers to the risks posed by electromagnetic fields	30	30	100 %
C.21	Monitoring healt of workers	45	45	100 %
C.22	Measures that may be applied in periods of extreme temperatures for the protection persons at work	12	12	100 %
D. Specific provisions				
D.1	Own Instruction of OHS in electrical installations of exploitation (operating)	30	30	100 %
D.2	Own Instruction of OHS for work under voltage	54	54	100 %
D.3	Own Instruction of OHS regarding how to complete the work permit under voltage	30	30	100 %
		TOTAL		**NC_g**
		756	**756**	**100 %**

GENERAL LEVEL OF SECURITY

Sheet Code	Name	Scores		Security level	Risk level
		Maximum (PM)	Obtained (PO)		
A	**Obligations of the employer**	408	408	100 %	Small
B	**Workers' rights and obligations**	99	96	96,96 %	Small
C. General provisions					
C.1	Minimum provisions at OHS	672	672	100 %	Small
C.2	Minimum safety and health provisions for sign at work	249	249	100 %	Small
C.3	Minimum safety and health provisions for use equipment by workers	360	360	100 %	Small
C.4	Minimum safety and health provisions for use of display screen equipment	60	60	100 %	Small
C.5	Minimum safety and health provisions for use of personal protective equipment by workers at work	54	54	100 %	Small
C.14	Minimum safety and health provisions regarding the exposure of workers to the risks posed by electromagnetic fields	90	90	100 %	Small
C.21	Monitoring healt of workers	132	132	100 %	Small
C.22	Measures that may be applied in periods of extreme temperatures for the protection persons at work	36	36	100 %	Small
D. Specific provisions					
D.1	Own Instruction of OHS in electrical installations of exploitation (operating)	90	90	100 %	Small
D.2	Own Instruction of OHS for work under voltage	162	162	100 %	Small
D.3	Own Instruction of OHS regarding how to complete the work permit under voltage	90	90	100 %	Small
		TOTAL		**NS_g**	**NR_g**
		2502	**2499**	**99,88 %**	**Small**

LEVEL OF SECURITY	LEVEL OF RISK
91-100 %	Small
81-90 %	Medium
71-80 %	High
under 71 %	Very high

Stage 4 – Certification and implementation of the ISO 37001: 2016 Standard - Anti-Bribery Management [11]

Stage 5 – Certification and implementation of ISO Standard 22301: 2019 - Business Continuity Management [11]

3. CONCLUSIONS

The frequent occurrence of cases of industrial insecurity in the context of economic, national and regional security, makes the topic addressed very topical and of great significance, knowing very well that the security strategies of strategic companies of national interest must be implemented, due to the interdependencies between the systems. Such an approach must start with industry decision-makers and top management of companies of strategic interest who own and operate critical national and european infrastructure.

The paper aims to identify the threats and vulnerabilities of critical infrastructures within the strategic company of national interest National Power Grid Transelectrica in order to combat and eliminate possible risks that threaten its proper functioning and be applicable by security liaison officers, experts, specialists and assessors on industrial safety and occupational health and safety issues, responding to the current needs and competencies of them.

The advantages of such an Integrated System at Industrial Security are the following:

- Identification of Strenghts– by SWOT technique, by the risk manager;
- Identification of Weaknesses– by SWOT technique, by the risk manager;
- Identification of Opportunities– by SWOT technique, by the risk manager;
- Identification of Threats– by SWOT technique, by the risk manager;
- Identification of national or european critical infrastructures – through the importance and facility of critical infrastructure, by the responsible public authorities;
- The level of criticality of critical infrastructures – criticality assessment, by the responsible public authorities;
- Interdependencies between critical infrastructures and systems – industrial and national security risk assessments, by the responsible public authorities;
- Identification of plausible risk scenarios with insecurity effect – by drawing up the Security Plan at the Critical Infrastructure Operator, by the security liaison officer – SLO;
- Assessment the risks of Occupational Health and Safety – by Assessing the risks of occupational injury and illness, by the Head of the Internal/External Prevention and Protection Plan Service – INCDPM (The National Research and Development Institute of Occupational Safety) Bucharest Method;
- Auditing of Occupational Health and Safety – by the method of Assessment of compliance with legal provisions and other provosions, by the Head of the Internal/External Prevention and Protection Plan Service – INCDPM (The National Research and Development Institute of Occupational Safety)Bucharest;

- Development of security and protection strategies regarding critical infrastructures – by drawing up the Security Plan for the Critical Infrastructure Operator, by the security liaison officer – SLO;
- Development of security and protection strategies for workers (personnel), by developing the Prevention and Protection Plan, by the Head of the Internal/External Prevention and Protection Service;
- Diminishing and stopping the bribery phenomenon (corruption) – by certifying and implementing the ISO 37001: 2016 Standard - Anti-Bribery management, by decision makers or the management of the strategic company of national interest;
- Diminishing and stopping the phenomenon of stopping the activity of industrial processes – by certifying and implementing the ISO 22301: 2019 Standard - Business Continuity Management, by decision makers or the management of the strategic company of national interest.

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