

Accident Risk Profile for Workers In the Electrical Sector in the City of Florencia - Caquetá

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Abstract

The objective of this work was to detect the accident risk profile of 131 electrical workers in Florencia, Caquetá, combining psychological and behavioral factors, using the Self-Perception of Risk Behavior Scale (EACR). This online tool measured 5 domains: impulsivity, aggressiveness, attentiveness, tendency toward regulatory control, and tendency toward substance use. All results indicated it was predominantly safe population (74.2% "safe" workers and 25.8% "cautious" workers; no high-risk cases were found). Rare accidents have been reported, with only 6% reporting accidents in the last six months. The inferential statistical analyses indicated that there was a statistically significant relationship between occurrence of accidents and elevated impulse response, elevated aggression, and elevated substance use ($p < 0.001$) but not for attentiveness or regulatory compliance. The results provided greater evidence that organizational safety culture is not a complete determinant of individual psychological and behavioral factors since such individual factors are significant determinants of the rates of occupational accidents. Possible benefits of developing the EACR include the ability to provide a validated assessment tool to detect workers that may have behavioral vulnerabilities and subsequently to design specific Behavior Based Safety interventions that reinforce the worker to uphold self-regulation and safe behavior practices, thus promoting long-term accident reductions in the EACR region.

Keywords: risk behavior, psychological factors, occupational psychology, workplace safety, electrical sector, behavior-based safety, occupational health.

1. Introduction

The prevention of work accidents is a high priority in the field of occupational safety and health (OSH) at the international and local levels. On Earth Hour 2023, the International Labour Organization (ILO, 2023) estimated that 2.9 million work-related deaths took place in 2022, putting the global economic cost of these deaths at 5.4% of GDP, or around US\$4 trillion a year. The estimated number of occupational accidents is 522,982 in Colombia in 2024 representing 4.0 accidents per 100 workers. The electricity supply sector had 1,312 accidents (rate of 4.38), which is above the national average. These figures indicate that electrical activity is naturally risky because of the interaction between humanity and technology during its use, and that there is a need for a thorough risk assessment and risk measures carried out on every organisational level. The absolute number of workplace accidents decreased, but also their trend in Florencia in the state of Caquetá, showing an increasing trend to five accidents in 2024 (2.24 per 100 workers), with two accidents in 2023 (3.20). Regional rates are still lower than national averages, but this is a progression toward higher rates which requires more effective prevention practices. Industrial safety strategies have previously been mainly technical and environmental focused, but current research dealing with Occupational health has shown the increasing importance of the human factor for the study of accidents and their prevention. Psychological and behavioral workers traits have regularly been proven to affect incident probabilities and severity effects, in an empirical way. Erinžeo Serge Rodríguez (2015) reported such relationships are present for negative emotions like anger and stress with higher rates of traffic accidents, which could be similar for feelings in the occupational context of electrical work. Villalobos and Zúñiga (2011) conducted a qualitative research study with injured workers, and showed that workers have intellectual knowledge about danger, but this knowledge does not necessarily accompany a meaningful change in their actions unless they also form preventive attitudes, which can eventually lead to habit formation. The results indicate that there is an important disconnect between awareness and action in occupational safety. These observations highlight the importance of considering external working conditions and internal factors that may increase the likelihood of the occurrence of unsafe behaviour. A large and evidence-based body of work in the field of Behavior-Based Safety

(BBS) has now emerged, which suggests that accident reductions occur when accident-prone, work-related behaviors and attitudes are systematically modified. Having employed models such as facial recognition, pattern matching and image subtraction, workplace safety has seen significant improvement in arresting and catching unsafe behaviors – and when these unsafe behaviors are replaced by safe behaviors, it is easy to see the direct link with the substantial decrease in the number of accidents and the cost thereof, making workplace safety a cost-effective complementary tool to the technical risk management measures to reduce risks. Occupational safety rules and standards in Colombia explicitly acknowledge the influence of psychosocial factors on the occurrence of disasters, and the methodology of disaster observation and positive feedback for effecting positive changes in an organization's safety culture (OSC). But, validated early-assessment tools in identifying the susceptibility to an individual accident are yet to be widely available and applicable in the electrical sector. Considering the low historical accident rates with indications of an increase in Caquetá and that the development of preventive screening mechanisms based on human factors is necessary to guarantee occupational health and worker protection in the long term. This study proposes a new evaluation model based on psychological dimensions relevant to the workplace safety and risk behaviours. The Self-Perception of Risk Behavior Scale (EACR) assesses five factors: impulsivity, aggressiveness, attention, regulatory compliance, and consumption tendency (Romero-Reyes, 2025). This innovative approach facilitates profiles worker-wise in each of these psychological aspects and predict risky behaviour and provides the corresponding dimensioned preventive action, before it happens. The electrical industry is a great example because unlike many other industries, unsafe acts in the electrical field have a devastating impact that can produce a severe injury or a fatality. Specific risk profiles enable prioritization of interventions for workers who show behavioural vulnerability patterns. Knowing which psychological issues are strongly associated with an accident occurrence will lead to targeting resources on evidence-based methods of prevention instead of the shotgun approach. In addition, the detection of an at-risk worker through the EACR offers a chance for targeted skill development, behavioral coaching and personalized safety mentoring. Studies indicate substantial gains in compliance and effectiveness when interventions are tailored to a worker's risk status. Psychological assessment within occupational health practice is in its infancy and has been recommended as an emerging good practice moving away from a reactive-style post accident investigation to a more proactive risk identification and risk prevention focus. By having these types of screening at their point of entry into the organization or as a periodic safety review, they could monitor risks continually and deploy them when needed. The overall research questions addressed were; thus: What were the types of incident risk profiles of electrical sector workers and what factors could be evaluated in comprehensively characterizing these incident risk profiles? The long-term goal is the design of regionally specific, evidence-based approaches that are effective for decreasing accidents, protecting workers, and achieving long-distance worker health: The hypothesis for this study is that there are meaningful differences in relationships among psychological factors and dimensions and between behaviors and dimensions and workplace accident occurrence, which could prove valuable in worker categorization by differing risk profiles and substantiate selection of an intervention strategy. This research is one step toward covering the psychological aspects of occupational safety in the Colombian context, as well as in the electrical sector in particular, because there are few studies on this topic. The findings in this study contribute to organizations by offering insights into the psychological factors that represent the most important risk for an accident and are used to guide personnel selection initiatives as well as training priorities, intervention planning and development for LTOHPs.

1.1 Research Questions

RQ1: To what extent do psychological and behavioral dimensions (impulsivity, aggressiveness, attention, regulatory compliance, and substance use) as measured by the EACR significantly predict workplace accident occurrence among electrical sector workers in Florencia, Caquetá, and what is the relative contribution of each dimension to overall accident risk assessment, prevention planning, intervention prioritization, and comprehensive occupational health outcomes?

RQ2: What are the specific and distinct risk profiles of electrical workers based on comprehensive psychological and behavioral assessment using the EACR instrument, and how do these identified profiles meaningfully differentiate between safe, cautious, inconsistent, and high-risk workers, thereby enabling targeted intervention design, evidence-based accident prevention strategy development, informed resource allocation, and comprehensive occupational safety enhancement for effectively reducing accident rates and promoting sustainable health and worker protection outcomes in the regional electrical sector?

2. Research Methodology

2.1 Type and Design of the Research

This study is framed within a quantitative approach, with a descriptive, cross-sectional design, which allows for the observation, measurement, and analysis of the characteristics of the phenomenon under investigation at a specific point in time. This design is suitable for identifying the accident risk profile of workers in the electrical sector in the city of Florencia, Caquetá, through the evaluation of psychological and behavioral factors.

2.2 Methodological Tools and Strategies

For data collection, the Self-Perception of Risk Behavior Scale (EACR) (Romero-Reyes, 2025) was used, an instrument designed to identify behaviors that may be associated with a higher probability of workplace accidents. This tool assesses five key dimensions: Impulsivity, Aggressiveness, Regulatory Compliance, Attention, and Consumption Tendency, aspects that directly impact safety and job performance. The assessment was administered virtually, using the MigeSTion system (RH Consultants, 2023), which allowed for greater coverage, confidentiality, and efficiency in data collection.

2.3 Hypothesis and variables

The following hypothesis was proposed for the development of this research:

H1: There is a significant relationship between the psychological and behavioral factors assessed by the EACR and the accident risk profile in workers in the electrical sector in Florencia Caquetá.

H0: There is no significant relationship between the psychological and behavioral factors assessed using the EACR and the accident risk profile in electrical sector workers in Florencia, Caquetá.

The dependent variable is the risk of workplace accidents and the independent variable is the psychological dimensions of impulsivity, aggressiveness, attention, regulatory compliance and consumption tendency.

2.4 Population and Sample

The population evaluated in this study consists of 180 workers in the electrical sector of the city of Florencia, Caquetá, directly or under contract with the company Electro Caquetá SA ESP and its contracting companies. The evaluation included both technical and administrative staff, with different levels of experience and seniority in the position.

Board1 Population and sample

Company name	Number of workers	Participating workers
Electrocaquetá SA ES P	42	28
MOVA INGENIERIA SAS	77	55
APC SOLUTIONS SAS	43	40
Multiservices Technical Engineering	18	8

Note: Own elaboration (2025).

Inclusion criteria

Electrical sector worker active in the company under study.

Exclusion criteria:

Newly hired workers without the corresponding training and knowledge in the electricity sector will be excluded from the study.

Ethical Aspects

This research is non-experimental, therefore, it does not manipulate variables that may affect the health or dignity of the person. In addition, each participant signs the informed consent form prior to the evaluation.

Limitations

No document review, interviews, or application of other types of tests is involved.

2.5 Techniques and tools used

This study's instrument was the Self-Perception of Risk Behavior Scale (EACR) (Romero-Reyes, 2025), which includes 50 items across 5 factors: impulsivity, aggressiveness, attention, normative compliance, and consumption tendency. This scale has a good degree of reliability (cronbach alpha coefficient is 0.75) and content validity (Aiken's coefficient is 0.96), ensuring the reliability and pertinence of its results.

2.6 Sampling Type

The sampling method used was non-probabilistic and non-random, guided by criteria of accessibility and availability of participants. This technique allowed the analysis to focus on a specific group of workers who meet characteristics relevant to the objectives of this study.

2.7 Data collection technique

Data collection was carried out using the self-administered virtual application of the EACR scale (Romero-Reyes, 2025), which facilitated voluntary participation by workers in a safe and confidential environment. This method also allows for more efficient control over time and data access, minimizing external interference.

3. Results and discussion

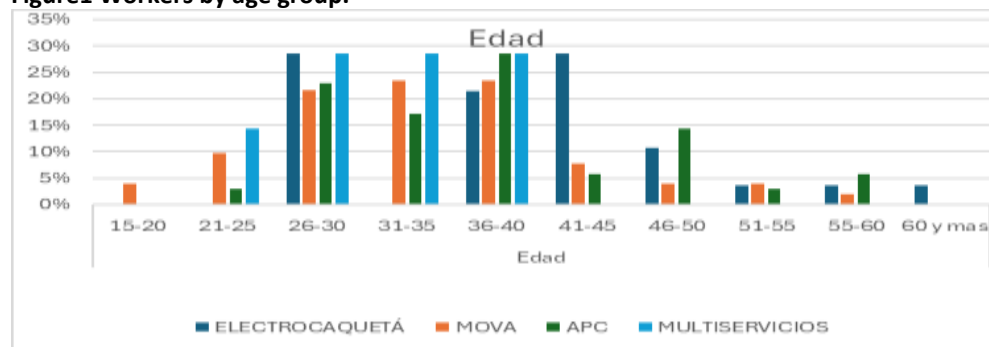
By analyzing the data obtained during the investigation, the specific objectives proposed to answer the research question are met, allowing the identification of the accident risk of workers in the electrical sector of Florencia Caquetá, finding consistency between the national accident statistics in the electrical sector and the results obtained in the four companies evaluated.

The results of the assessment using the EACR self-perception risk behavior scale identify a risk profile in workers oriented towards safe behavior as will be shown in the description of results of the second objective, identifying safe and cautious personality profiles.

3.1 Distribution by age groups

Figure 1 shows the distribution of workers by age group in the four companies in the electricity sector evaluated.

Figure1 Workers by age group.



NoteThe illustration shows workers by age group. Source: Author's own elaboration (2025).

The sample consisted of workers from four companies in the electrical sector in Florencia, Caquetá. The companies participating in this study have uneven age ranges. Electrocaquetá SA ESP and APC SOLUCIONES SAS have a more experienced workforce, with a high number of employees between 26 and 45 years old. On the other hand, MOVA INGENIERIA SAS has a younger team, with a higher proportion of workers between 20 and 30 years old; however, it has smaller proportions of workers in the other age groups. Multiservicios Técnicos de Ingeniería has a more balanced age distribution; it appears to focus on hiring very young personnel and has no employees over 40 years old, which could suggest high staff turnover.

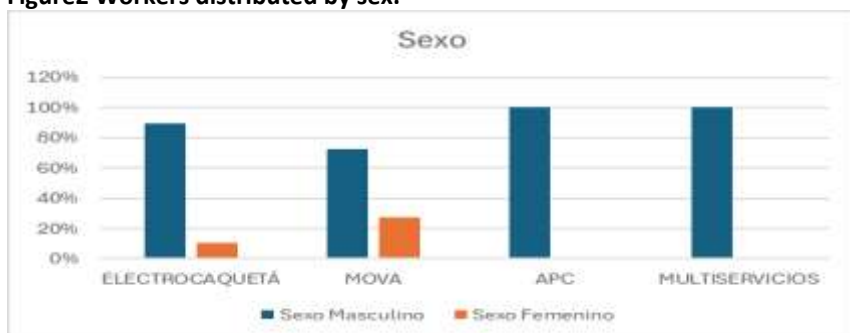
The participating population shows an active and functional structure, with a high percentage of young and adult

workers, which could facilitate adherence to behavior-based safety programs, due to their interest in continuous training and ability to modify habits or behaviors prone to risks.

3.2 Distribution by sex

Figure 2 shows the distribution of workers according to reported sex.

Figure2 Workers distributed by sex.



NoteThe figure shows the workers distributed by sex. Source: Author's own elaboration (2025).

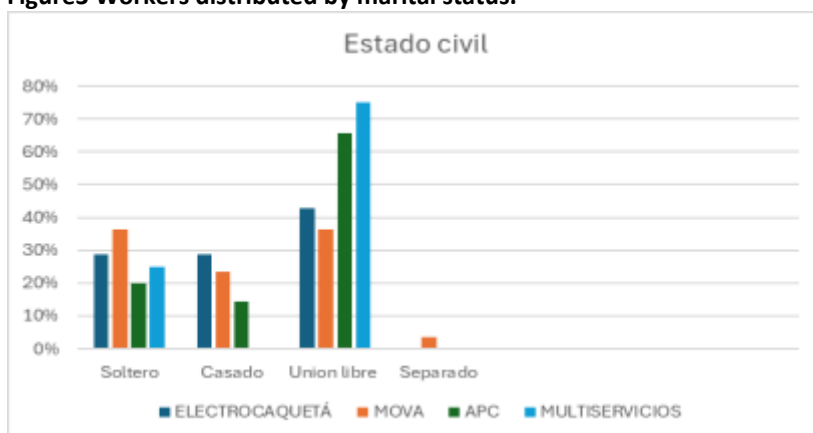
The graph shows a high percentage of male workers in the four companies evaluated. Multiservicios Técnicos de Ingeniería and APC SOLUCIONES SAS have 100% male employees, while Electrocaquetá SA ESP has 89% male employees and 11% female employees. MOVA INGENIERIA SAS has 73% male employees and 27% female employees.

The high presence of males among the workers of the companies evaluated is consistent with the historical labor structure of the electricity sector, where the greater participation of male workers in said sector stands out, especially in operational and technical positions.

3.3 Distribution by marital status

Figure 3 shows the distribution of workers by marital status.

Figure3 Workers distributed by marital status.



NoteThe figure shows the workers distributed by marital status. Source: Author's own elaboration (2025).

The analysis of the marital status of the workers evaluated in the 4 companies indicates that common-law unions predominate; this may be due to cultural or generational factors.

The distribution by marital status within the evaluated companies is as follows:

Electrocaquetá SA ESP has 28.6% of its workers who are single and the same percentage who are married, and the remaining 42.9% of workers are in a common-law relationship.

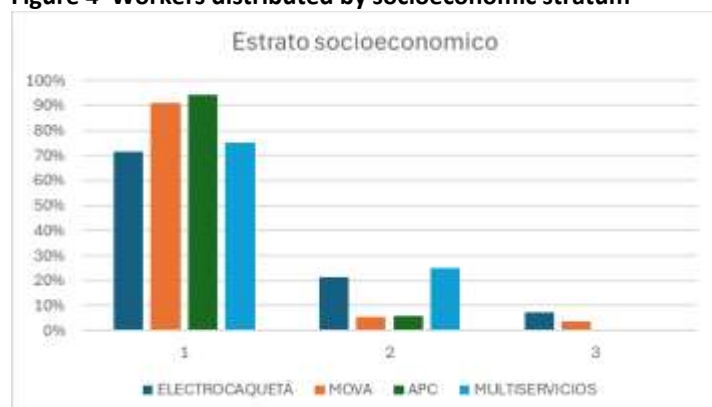
At MOVA Ingeniería SAS, single workers and workers in common-law unions predominate, with a percentage of 36.4% respectively, while 23.6% of workers are married and only 3.6% are separated.

Furthermore, at the company Multiservicios Técnicos de Ingeniería, 75% of the workers live in common-law relationships and the remaining 25% are single; no married or separated workers are reported. Finally, at APC SOLUCIONES SAS, 65.7% of its workers report living with their partners in a common-law relationship, with 20% of workers being single and 14.3% married, and no married workers are reported.

3.4 Distribution by socioeconomic stratum

Figure 4 shows the distribution of workers by socioeconomic stratum.

Figure 4 Workers distributed by socioeconomic stratum



NoteThe figure shows the workers distributed by socioeconomic stratum. Source: Author's own elaboration (2025).

The data obtained show that the majority of workers evaluated belong to low socioeconomic strata, with a predominance in stratum 1.

In the companies MOVA INGENIERIA SAS and APC SOLUCIONES SAS, 90% of their workers reside in areas of stratum 1. While in Multiservicios Técnicos de Ingeniería and Electrocaquetá SA ESP, 76% and 70% respectively belong to said socioeconomic stratum.

Regarding socioeconomic stratum 2, we find that 24% of the workers at Multiservicios Técnicos de Ingeniería belong to this stratum, 20% at Electrocaquetá SA ESP, and only 10% at MOVA INGENIERIA SAS. On the other hand, stratum 3 is only reported at Electrocaquetá SA ESP and MOVA INGENIERIA SAS, with less than 10% of their workers belonging to this stratum.

Overall, the graph shows that the socioeconomic profile of the workers evaluated is mainly at low levels, reflecting modest economic conditions, possibly associated with operational or technical positions.

3.5 Distribution by time in the position.

Figure 5 shows the length of time the workers have been in their current position.

Figure5 Workers distributed by time in the position.



NoteThe figure shows the workers distributed by time in the position. Source: Author's own elaboration (2025). According to the data analyzed, 100% of the employees in the four companies have been in their current position for less than a year. This could be due to recent hiring or a change of role within the company within the last year.

3.6 Time distribution in the company.

Figure 6 shows the length of time that workers have been associated with the company.

Figure6 Workers distributed by time in the company.



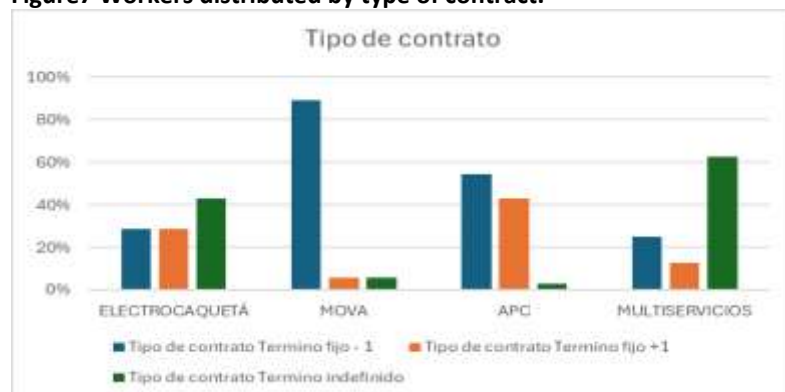
NoteThe figure shows the workers distributed by time within the company. Source: Author's own elaboration (2025).

Although all employees have been in their current positions for less than a year, some have longer tenure with the company: at MOVA INGENIERIA SAS, 60% of employees have been with the company for less than a year, which could indicate a high staff turnover rate, while at Electrocaquetá SA ESP, approximately 50% of its employees have been with the company for 1 to 5 years, 18% have been with the company for 6 to 10 years, and around 10% have been with the company for 11 to 31 years; thus indicating that it is a company with a long history in the region. On the other hand, in the case of APC SOLUCIONES SAS, 60% of its personnel have 1 to 5 years in the company, 35% have less than 1 year and even the minimum time was 6 to 10 years. On the other hand, at Multiservicios Técnicos de Ingeniería, the largest number of employees are in the range of 1 to 5 years of seniority, and between the range of 6 to 10 years and less than one year, the remaining 25% of the workers respectively.

3.7 Distribution by contract type.

Figure 7 shows the type of contract under which the workers are bound.

Figure7 Workers distributed by type of contract.



NoteThe figure shows the workers distributed by type of contract. Source: Author's own elaboration (2025).

Analysis of the data collected from the four companies indicates that a high percentage of workers are employed on fixed-term contracts of less than one year, especially at MOVA INGENIERIA SAS, where 89% of employees are on

this type of contract. APC SOLUCIONES SAS has 54% of its employees on this type of contract, while Electrocaquetá SA ESP uses it less frequently (29%), and finally, Multiservicios Técnicos de Ingeniería has the lowest proportion, with 25% of its employees on this type of contract.

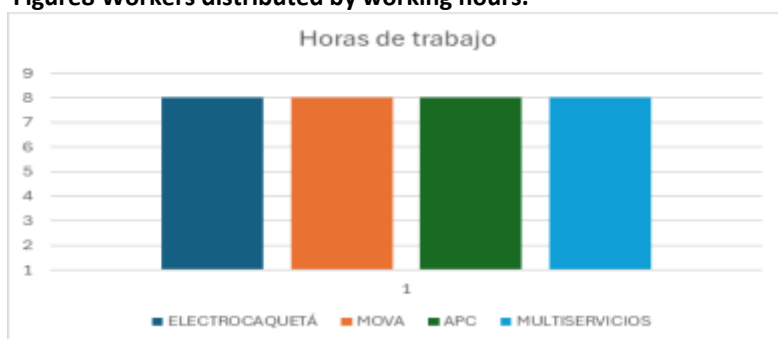
Regarding the fixed contract modality of more than one year; the distribution by company is as follows: APC SOLUCIONES SAS (43%), Electrocaquetá SA ESP (29%), Multiservicios Técnicos de Ingeniería (13%) and MOVA INGENIERIA SAS (6%).

Finally, regarding the indefinite term contract modality, we find that the company with the largest number of workers linked under this modality is Multiservicios Técnicos de Ingeniería (63%), followed by Electrocaquetá SA ESP (43%), then MOVA INGENIERIA SAS (6%) and with a smaller proportion is the company APC SOLUCIONES SAS (3%).

3.8 Distribution by working hours.

Figure 8 shows the distribution of workers according to working hours.

Figure8 Workers distributed by working hours.



NoteThe figure shows the workers distributed by daily working hours. Source: Author's own elaboration (2025).

In the analysis of the data collected in the 4 companies evaluated, the workers reported working an 8-hour day, which indicates that their schedules comply with what is legally established for the ordinary workday in Colombia.

3.9 Distribution by salary type.

Finally, Figure 9 shows the type of salary of the workers in each company.

Figure9 Workers distributed by salary type.



NoteThe figure shows the distribution of workers by salary type in each company. Source: Author's own elaboration (2025).

The graph shows that fixed salaries predominate in the four companies evaluated. At APC SOLUCIONES SAS, 100% of employees have fixed salaries. At Multiservicios Técnicos de Ingeniería, only 13% of employees have variable salaries; the rest have fixed salaries. At Electrocaquetá SA ESP and MOVA INGENIERIA SAS, 4% and 2% of employees, respectively, have variable salaries, while the rest have fixed monthly salaries. This indicates that employment levels are relatively stable.

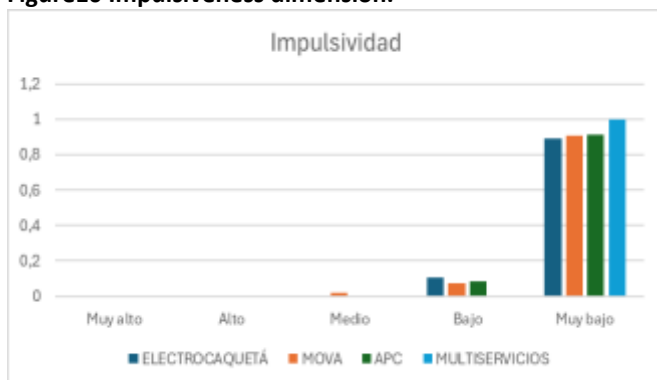
3.10 Identification of accident risk profiles in the electrical sector in Florencia Caquetá.

For this purpose, the Self-Perception of Risk Behavior Scale (EACR) was used, an instrument that assesses five dimensions related to safe behavior at work: impulsivity, aggressiveness, attention, regulatory compliance, and substance use. Based on the scores obtained in each dimension, it was possible to classify the workers into different risk profiles: safe worker, cautious worker, inconsistent worker, or risky worker.

3.11 Impulsiveness dimension.

Figure 10 below presents the impulsivity levels obtained by the evaluated workers.

Figure10 Impulsiveness dimension.



NoteThe figure shows the impulsivity levels in the workers evaluated. Source: Author's own elaboration (2025).

The graph shows that, in the four companies evaluated, the majority of employees scored very low on impulsivity, which is a very positive result. This pattern holds true across all organizations, with Multiservicios Técnicos de Ingeniería having its entire staff in this category.

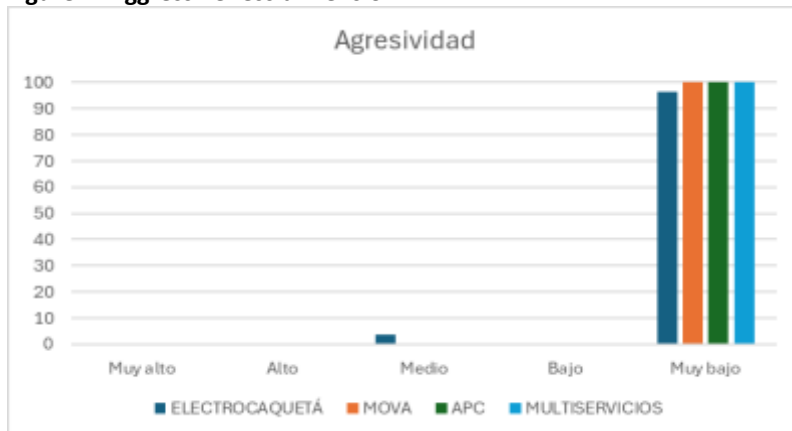
Although small percentages of workers are observed with low or medium levels, these cases are very isolated and do not represent a significant trend. For example, at MOVA INGENIERIA SAS there is one isolated case with a medium score, and both at ELECTROCAQUETÁ SA ESP and APC SOLUCIONES SAS there are some workers classified at a low level.

These results indicate that, in general, workers tend to control their impulses, make more thoughtful decisions, and avoid reactive or hasty behavior in their work environment, which significantly reduces the risk of accidents caused by impulsive actions. This dimension, being so highly scored, becomes a strength of the behavioral profile of the evaluated sample.

3.12 Aggressiveness dimension.

Figure 11 shows the levels of aggressiveness observed in the workers.

Figure11 Aggressiveness dimension.



NoteThe figure shows the levels of aggression in the evaluated workers. Source: Author's own elaboration (2025).

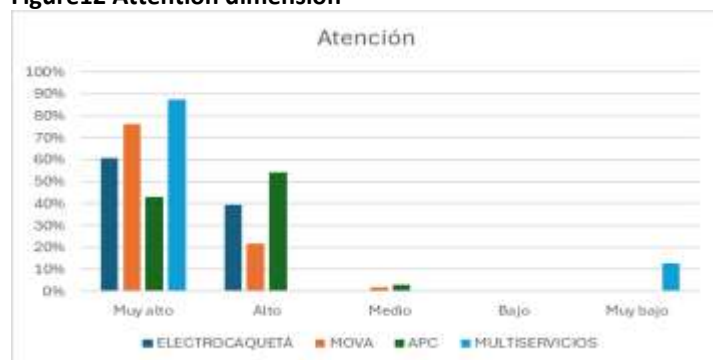
The graph shows that, in the companies evaluated, the vast majority of workers were at the “very low” level of aggressiveness, indicating that they tend to maintain a calm and controlled attitude in work situations. Multiservicios Técnicos de Ingeniería, APC SOLUCIONES SAS, and MOVA INGENIERIA SAS show 100% of their workers at this level, and Electrocaquetá SA ESP presents a very similar result, with only one isolated case at the “medium” level.

This result suggests that, in general, workers do not exhibit hostile, reactive, or defiant behavior, which contributes positively to workplace harmony and, of course, to safety.

3.13 Attention dimension.

Figure 12 below illustrates the levels of attention achieved by workers in the evaluated companies.

Figure12 Attention dimension



NoteThe figure shows the levels of attention in the evaluated workers. Source: Author's own elaboration (2025).

In this dimension, the outlook is very positive. The majority of the workers evaluated scored at very high and high levels of attention, indicating that they have a good capacity to remain focused, alert, and aware of their tasks and work environment.

Multiservicios Técnicos de Ingeniería stands out, with almost 87.5% of its employees achieving a very high level, followed by MOVA INGENIERIA SAS and Electrocaquetá SAS ESP, with 77% and 60% respectively in that same category. At APC, although the very high level is slightly lower, this is offset by a good percentage at the high level, maintaining a positive balance.

Only minimal cases were recorded at medium levels and a single group at a very low level, also in Multiservicios Técnicos de Ingeniería. These isolated cases could be related to frequent distractions or difficulty maintaining focus.

These results suggest that workers have a good level of sustained attention, which translates into a greater ability to identify hazards, follow instructions, and make safe decisions during the workday. This dimension represents a key strength for accident prevention in the companies evaluated.

3.14 Regulatory compliance dimension.

Figure 13 shows the levels of regulatory compliance in the evaluated workers.

Figure13 Regulatory compliance dimension.



NoteThe figure shows the levels of regulatory compliance among the evaluated workers. Source: Author's own elaboration (2025).

The results for this dimension reflect a good level of compliance with safety standards and procedures by workers in general. The majority fall between high and very high levels, indicating a strong willingness to follow instructions, use personal protective equipment, and participate in prevention activities.

APC SOLUCIONES SAS stands out for having 80% of its employees at the high level, demonstrating a strong culture of regulatory compliance. Multiservicios Técnicos de Ingeniería also shows a favorable result, with 75% of its employees at the very high level, although it also has a small group at the very low level, which could be an area for the company to address.

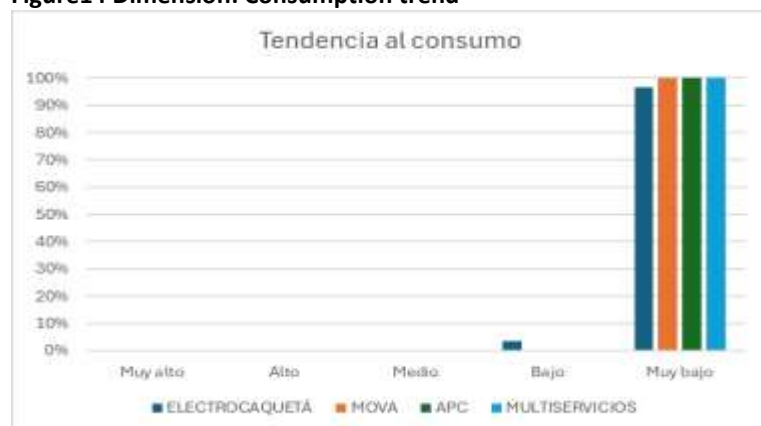
At Electrocaquetá SA ESP and MOVA INGENIERIA SAS, the workers are mostly distributed between the high and very high levels, with minimal cases at the medium level, which reaffirms the overall positive trend.

In summary, this dimension indicates that the majority of workers exhibit behaviors aligned with safety standards, providing a solid foundation for strengthening a preventative culture. Even so, it is important to monitor the few cases that do not meet expected levels, especially in Multiservicios Técnicos de Ingeniería, where more specific actions may be required.

3.15 Dimension: trend towards consumption.

Figure 14 presents the levels of consumption tendency identified in the evaluated workers.

Figure14 Dimension: Consumption trend



NoteThe figure shows the levels of consumption tendencies among the workers evaluated. Source: Author's own elaboration (2025).

The results in this area are very positive. Virtually all the workers evaluated in the four companies were at the “very low” level of consumption tendency, indicating that no worrying signs were identified related to the use of substances that could affect their performance or increase the risk of workplace accidents.

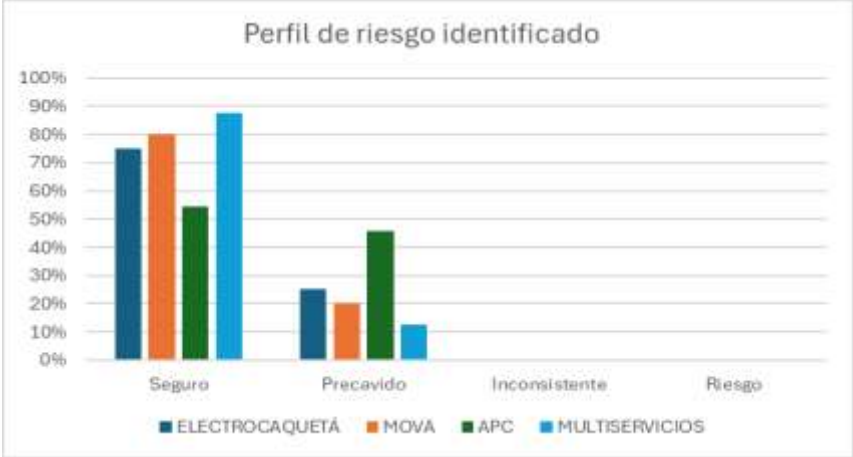
Electrocaquetá SA ESP has a small percentage at the low level, but this group is minimal and does not represent a significant trend. At MOVA INGENIERIA SAS, APC SOLUCIONES SAS, and Multiservicios Técnicos de Ingeniería, all workers are at the lowest level, which is an indication of self-care and work environments that are possibly not exposed to risk factors associated with alcohol or other substance use.

This result allows us to conclude that substance use does not currently represent a relevant risk factor within the evaluated organizations, which contributes to strengthening the overall safety profile of the workers.

3.16 Identified risk profile.

Figure 15 shows the distribution of the risk profiles identified from the results of the assessment.

Figure15 Identified risk profile



NoteThe figure shows the risk profile identified in the evaluated workers. Source: Author's own elaboration (2025). When observing the risk profiles obtained from the EACR scale, it is evident that the majority of workers were classified as "safe," indicating a low risk of accidents associated with unsafe behaviors. This profile predominates in all companies, especially in Multiservicios Técnicos de Ingeniería (88%), MOVA INGENIERIA SAS (80%), and Electrocaquetá SA ESP (75%). This reflects that, in general, workers have good safety practices, control their impulses, follow rules, and are attentive while performing their tasks. On the other hand, a group of workers with a cautious profile was also identified, mostly from APC SOLUCIONES SAS (45%), indicating that, although they generally maintain safe practices, they may require some reinforcement in certain areas. This profile also appears, to a lesser extent, in the other companies. It is important to highlight that no "inconsistent" or "risky" profiles were recorded in any of the evaluated organizations, which is a very favorable result and speaks well of the work environment in which the workers operate.

3.17 Relationship between psychological factors and the risk of workplace accidents

Analyze the relationship between the psychological dimensions assessed and workplace accident rates in order to propose specific prevention strategies. In order to identify whether the psychological factors evaluated have a direct relationship with workplace accidents, the analysis of variables with the occurrence of accidents is carried out and statistical tests such as Chi-square are performed to identify the statistically significant relationship between the two variables evaluated, in table 3 the relationship between the impulsivity dimension with the occurrence of accidents is identified.

Board2 Relationship between impulsivity dimension and accident occurrence.

		ACCIDENT IN THE LAST 6 MONTHS		Total
		Yeah	No	
IMPULSIVITY (classification)	Very Low	6	114	120
	Low	1	9	10
	Half	1	0	1
Total		8	123	131

Note. Own elaboration (2025). Table 3 shows that, of the 131 workers evaluated, 8 reported having suffered workplace accidents; of these, 6 were in the very low category, 1 in the low category, and 1 in the medium category. According to the results obtained, there appears to be no relationship between impulsivity and the occurrence of accidents; therefore, a statistical analysis is necessary to validate or refute this claim. To determine the statistical significance of these results, a statistical analysis was performed using the Chi-square test, as shown in Table 4.

Board3 Statistical analysis.

Chi-square tests			
	Worth	Degrees of Freedom (df)	Asymptotic significance (bilateral)
Pearson's Chi-square	15,896a	2	0.000
Linear association by linear	6,896	1	0.009
Number of valid cases	131		

Note. Own elaboration (2025).

Pearson's chi-squared statistical analysis identified a significant relationship ($p = 0.000$), indicating a statistically significant correlation between impulsivity level and accident occurrence. This finding is reinforced by the linear-by-linear association test, which indicates a linear trend: as impulsivity increases, the probability of accidents also rises. While a higher number of workers with reported accidents were found to be in the very low impulsivity group, the statistical analysis establishes a significant and direct relationship between impulsivity levels and accident occurrence.

The correlation between impulsivity and accident occurrence shows a significant association, but it does not have strong predictive power. However, it makes it clear that this risk factor should not be underestimated, as workers with higher levels of impulsivity may be more prone to making quick decisions, poor self-regulation, and unsafe behaviors, which can lead to workplace accidents.

The analysis of the aggressiveness dimension and the occurrence of accidents is shown below in Table 5.

Board4 Relationship between the aggressiveness dimension and the occurrence of accidents.

		ACCIDENT IN THE LAST 6 MONTHS		Total
		Yeah	No	
AGGRESSIVENESS (classification)	Very Low	7	123	130
	Half	1	0	1
Total		8	123	131

Note: Own elaboration (2025).

Table 4 indicates that the only worker with a medium level of aggression did have a workplace accident. The workers who did not have accidents exhibited a very low level of aggression. This suggests a possible relationship between high levels of aggression and the occurrence of accidents, therefore requiring an evaluation of statistical significance, as shown in Table 6.

Board5 Statistical analysis.

	Worth	Df	Asymptotic significance (bilateral)
Pearson's Chi-square	15,493a	1	0.000
Linear association by linear	15,375	1	0.000
Number of valid cases	131		

Note: Own elaboration (2025).

Pearson's chi-squared statistical analysis identified a statistically significant association between the aggressiveness dimension and the occurrence of workplace accidents. Furthermore, the linear-by-linear association test was significant ($p=0.000$), suggesting a trend in the variable's behavior. Although most of the workers evaluated exhibited very low levels of aggressiveness, the mere presence of a worker with moderate aggressiveness and the occurrence of an accident increased the relationship, making it statistically significant. This indicates that even in small proportions, uncontrolled levels of aggressiveness represent a critical risk factor.

This statistical analysis rejects the null hypothesis since there is a significant relationship between the aggressiveness dimension and the occurrence of accidents; the higher the level of aggressiveness, the greater the

risk of work accidents.

The attention dimension on the EACR scale is interpreted in the opposite way to impulsivity or aggressiveness: high values are desirable, as they reflect greater concentration, vigilance, and ability to avoid operational errors in the workplace. Table 7 analyzes the relationship between the attention dimension and the occurrence of accidents.

Board6 Relationship between the attention dimension and the occurrence of accidents.

		ACCIDENT IN THE LAST 6 MONTHS		Total
		Yeah	No	
ATTENTION (classification)	Very Low	0	1	1
	Half	1	2	3
	High	2	44	46
	Very high	5	76	81
Total		8	123	131

Note: Own elaboration (2025).

In Table 7, entitled "Relationship between the attention dimension and the occurrence of accidents," the results show a logical and expected trend: the higher the level of attention, the lower the proportion of workers who suffer work accidents. The majority of workers present high (46) and very high (81) levels of attention, which is a generally positive profile in the sample. Even so, seven of the eight accidents occurred in people with either high or very high attention. At first glance, this might seem contradictory; however, we must consider that almost the entire sample is concentrated in these two ranges, so accident rates should be evaluated proportionally, not in absolute numbers.

Given that at first glance there appears to be no significant relationship between the attention dimension and the occurrence of accidents, a statistical analysis must be performed to evaluate the significance of the relationship. This analysis is presented in Table 8.

Board7 Statistical analysis.

Chi-square tests

	Worth	df	Asymptotic (bilateral)	significance
Pearson's Chi-square	4,192a	3	0.241	
Linear association by linear	0.116	1	0.733	
Number of valid cases	131			

Note: Own elaboration (2025).

The statistical analysis does not reveal a statistically significant relationship between attention and accident occurrence. The p-value exceeds 0.05, therefore the null hypothesis is not rejected. Furthermore, the linear-by-linear association test does not show a clear trend between high levels of attention and a lower risk of accidents, ruling out a direct linear correlation.

Now in Table 9 we explore the relationship between the regulatory compliance dimension and the occurrence of accidents.

Board8 Relationship between the regulatory compliance dimension and the occurrence of accidents.

			ACCIDENT IN THE LAST 6 MONTHS		Total
			Yeah	No	
REGULATORY (classification)	COMPLIANCE	Very Low	0	1	1
		Half	2	5	7
		High	4	74	78
		Very high	2	43	45
		Total	8	123	131

Note: Own elaboration (2025).

The regulatory compliance dimension reflects the worker's willingness to follow rules such as regulations and safety procedures. Table 8 shows that most workers fall into the high and very high regulatory compliance categories. The group with the highest number of accidents was the high category (4 accidents), followed by the very high and medium categories, with two accidents each.

This suggests that a lower regulatory compliance rating may be associated with a higher risk of accidents. To confirm this assertion, a statistical analysis is necessary to determine the level of significance, which will be addressed in Table 10.

Board9 Statistical analysis.

Chi-square tests				
	Worth	df	Asymptotic (bilateral)	significance
Pearson's Chi-square	6,573a	3	0.087	
Linear association by linear	1,531	1	0.216	
Number of valid cases	131			

Note. Own elaboration (2025).

The statistical analysis of Table 10 shows that, although there is an apparent difference between regulatory compliance levels and accidents, it is not statistically significant at the traditional confidence level ($p > 0.05$). In other words, the null hypothesis is not rejected, nor was a significant linear trend found between higher compliance levels and a lower probability of accidents.

In this sample, no statistically significant relationship was found between the level of regulatory compliance and the occurrence of workplace accidents. However, the data show an important trend: workers with "average" classifications had a higher proportion of accidents than those with high or very high regulatory compliance.

Next, in Table 11, let's explore the relationship between the fifth dimension (consumption tendency) and the occurrence of accidents.

Board10 Relationship between the tendency to consume and the occurrence of accidents.

		ACCIDENT IN THE LAST 6 MONTHS		Total
		Yeah	No	
CONSUMER TREND (classification)	Very Low	7	123	130
	Low	1	0	1
Total		8	123	131

Note. Own elaboration (2025).

In Table 11, entitled "Relationship between the Consumption Tendency Dimension and the Occurrence of Accidents," only one person was classified in the "low consumption tendency" range and had an accident, which may be an atypical or unrepresentative result. This result should be interpreted with caution; therefore, a statistical analysis was performed in Table 12 to verify its significance.

Board11 Statistical analysis.

	Worth	df	Asymptotic significance (bilateral)
Pearson's Chi-square	15,493a	1	0.000
Linear association by linear	15,375	1	0.000
Number of valid cases	131		

Note. Own elaboration (2025).

In the statistical analysis presented in Table 12, the chi-square value is 15.493 with 1 degree of freedom, and the two-tailed asymptotic significance is $p = 0.000$, indicating a statistically significant association between the level of tendency to consume and the occurrence of workplace accidents. The linear-by-linear association is also significant

($p = 0.000$), reinforcing the fact that, despite the few cases in the "low range," there is a linear pattern in the relationship between the two variables.

Although the chi-square test shows a significant association ($p > 0.001$) between consumption patterns and accident occurrence, this association is strongly influenced by a single case and does not reflect sufficient variability in the sample to draw a firm conclusion. Therefore, in this specific population, consumption patterns are not established as a determining factor in accident risk, although further investigation is recommended in studies with a greater diversity of responses.

To conclude, in Table 13 we will analyze the relationship between personality type and accident occurrence.

Board12 Relationship between personality type and accident occurrence.

		ACCIDENT IN THE LAST 6 MONTHS		Total
		Yeah	No	
PERSONALITY TYPE	Safe worker	5	87	92
	Cautious worker	2	34	36
	Inconsistent worker	1	1	2
	High-risk worker	0	1	1
Total		8	123	131

Note. Own elaboration (2025).

Although the distribution of accidents does not show marked differences between personality types such as "safe worker," "cautious," "inconsistent," and "risk-taker," for example, 6% of safe workers reported accidents (5 out of 92), while the rate was slightly higher (5.5%) among cautious workers. However, these differences are minimal and may be due to chance.

In this sample, no statistically significant relationship was found between workers' personality type and the occurrence of accidents in the last six months. Although differences exist in the proportion of accidents based on personality type, these are not sufficient to establish a reliable association, and further statistical analysis is required to confirm a statistically significant relationship between these two variables, as shown in Table 14.

Board13 Statistical analysis.

	Worth	df	Asymptotic (bilateral)	significance
Pearson's Chi-square	6,877a	3	0.076	
Linear association by linear	,840b	1	0.359	
Number of valid cases	131			

Note. Own elaboration (2025).

Although the chi-square value approaches the significance threshold ($p = 0.076$), it does not reach a statistically significant level ($p > 0.05$). This reinforces the previous conclusion: it cannot be stated that there is a strong association between the worker's personality type and the occurrence of recent workplace accidents, at least in this sample of 131 cases.

Table 15 below presents the summary table of the variables analyzed and their relationship with the occurrence of work accidents, indicating whether the association was statistically significant or not according to the p-value of the Pearson Chi-square statistic ($p < 0.05$).

Board14 Summary table of association between psychological variables and workplace accidents.

Variable analyzed	Chi-square	p-value	Statistically significant association
Impulsiveness (classification)	15,896	0.000	Yeah
Aggressiveness (classification)	15,493	0.000	Yeah

Consumption trend (classification)	15,493	0.000	Yeah
Regulatory compliance	6,573	0.087	No
Personality type	6,877	0.076	No
Attention (classification)	4,192	0.241	No

Note. Own elaboration (2025).

Variables with $p < 0.05$ were considered significantly associated with the occurrence of accidents, indicating that the levels of these variables may influence unsafe behavior or risk exposure. Variables that were not statistically significant do not rule out their practical relevance, but this analysis did not find sufficient statistical evidence to establish a direct relationship with reported accidents.

4. Conclusions and limitations

This research successfully identified the risk profile of the workers of electricity sector in the city of Florence using a security assessment tool based on the dimensions of impulsivity, aggressiveness, regulatory compliance, attention and consumption tendency. The statistic analysis carried out identified significant relationships between some psychological and behavioral evaluations and the occurrence of the last six months of the work accident in the workers sample. First, statistically significant relationships were obtained with variables like impulsivity, aggressiveness and substance use, indicating that some personality traits and behavioral patterns appear to be directly related to the risk of accidents. Even low and medium level categories of these variables exhibited obvious improvements with case incidence, even as risk factors, and were therefore significant exposures. In contrast, variables showing no statistically significant link with accidents—the percentage differences in exposure levels were the same for these categories—attention to detail, and regulatory compliance. On personality type, the same was true; although workers in this personality category had the most number of accidents, this was not statistically significant. Overall, the hypothesis that some individual psychological factors make a difference in unsafe behavior was confirmed that could contribute to an accident. These results will help identify workers with increased risk and will be important input for developing differentiated and customized preventive measures when implementing prevention using a behavior-based safety approach.

4.1 Recommendations

Based on those obtained in this research and taking into account the electrical sector is a high risk working sector, the following prevention strategies for continuous improvement in management and labor work safety and health are suggested: 2. Reinforce and maintain positive patterns of safe, cautious behavior among workers already in the workplace and monitor for a few individual cases of moderate levels of impulsivity/aggressiveness and relatively low levels of attention and regulatory compliance. When these factors are not properly controlled they may become potential places where accident may occur. Hence, it is recommended that the monitoring mechanism be reinforced by periodic evaluations that can support the monitoring of the dynamics of these dimensions over time. Likewise, it is critical to provide training, awareness and individual enhancement practices to support employees who do not meet the objective score, so that safe maintenance performance is maintained. The enhancements to these activities will help establish a stronger culture around safety, minimize the risk of unsafe practices that could lead to an incident, and build the sustainability of safe working surfaces in the electricity generation industry. 3. Resocialization and selection and promotion of personnel in the electricity sector should take into account the evaluation of psychological risk factors: As electricity sector personnel can occasionally find themselves in situations of potential risk, there is a need to re-socialize and select/promote people based on the assessment of their accident risk factors, including the use of instruments such as the EACR-SPOR. These measures will enable the identification of a candidate that has an acceptable “safe” behavior profile prior to hire, to maximize match to the job specification and minimise the risk of an unsafe type of behaviour that could result in an accident in the workplace. This approach will assist in the development of a workforce that has safety credentials more closely matched with the industry. All the strategies outlined above will be very effective if management is committed to following the guidelines and policies on occupational safety and health. However, it is worth to note that despite not being part of the field of the study, intervention recommendations were made to the participating organizations. These recommendations have been shared with the relevant organisations.

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