

Improving the performance in occupational health and safety management in the electric sector: An integrated methodology using fuzzy multicriteria approach

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Abstract

The electric sector is fundamental for the economic and social development of society, impacting on essential aspects such as health, education, employment generation, industrial production, and the provision of various services. In addition to the above, the growing trend in energy consumption worldwide could increase, according to expert estimates, up to 40% by 2030, which in turn increases the efforts of the public and private sector to meet increasing demands and increase access to energy services under requirements of reliability and quality. However, the electricity sector presents challenges and complexities, one of which is the reduction of health and safety risks for workers, service users, and other stakeholders. In many countries, this sector is classified as high risk in occupational safety and health, due to its complexity and the impact of accidents and occupational diseases on the health of workers, in infrastructure, in operating costs and competitiveness of the energy sector. Worldwide, there are rigorous regulations for the electricity sector, from local and national government regulations to international standards to guarantee health and safety conditions. However, it is necessary to develop objective and comprehensive methodologies for evaluating occupational safety and health performance that provides solutions for the electricity sector, not only to comply with standards and regulations also as a continuous improvement tool that supports the decision-making processes given the complexity of the industry and the multiple criteria that are taken into account when evaluating and establishing improvement strategies. In scientific literature, different studies focus on the analysis of accident statistics, the factors that affect accidents and occupational diseases, and the risk assessment of the

sector. Despite these considerations, studies that focus directly on the development of hybrid methodologies for the evaluation and improvement of performance in occupational safety and health in the electrical sector, under multiple criteria and uncertainty are mostly limited. Therefore, this document presents an integrated methodology for improving the performance in occupational health and safety in the electric sector through the application of two techniques of Multi-criteria Decision Methods (MCDM) uses in environments under uncertainty. First, the fuzzy Analytic Hierarchy Process (FAHP) is applied to estimate the initial relative weights of criteria and sub-criteria. The fuzzy set theory is incorporated to represent the uncertainty of decision-makers' preferences. Then, the Decision-making Trial and Evaluation Laboratory (DEMATEL) used for evaluating the interrelations and feedback among criteria and sub-criteria. FAHP and DEMATEL are later combined for calculating the final criteria and sub-criteria weights under vagueness and interdependence. Subsequently, we applied the proposed methodology in a company of the energy sector for diagnosis of performance in OHS to establish improvement proposals, the work path, and implementation costs. Finally, we evaluate the impact of the strategies applied in the improvement of the performance of the company.

Keywords

Fuzzy analytical hierarchy process, Fuzzy AHP, Multicriteria decision making, MCMD DEMATEL, Occupational health and safety, ISO 45001, Electric sector, Performance evaluation