

Mourad Chebila, 2023, Many-objective robust decision making for efficient designs of safety instrumented systems, *Process Safety and Environmental Protection*, 172 (2023) 869–881.

**Abstract** A robust decision making framework is proposed to support the appropriate design and use of safety instrumented systems. This framework incorporates many-objective optimization, uncertainty analysis, robustness assessment [including info-gap robustness], scenario discovery and sensitivity analysis to enhance the decision maker's confidence in selecting a suitable policy and assessing its ability to perform as required under a wide range of plausible states of the world with a clear definition of any existing limitations and vulnerabilities. For this, the probabilistic behavior of safety instrumented systems is taken into account with detailed presentations and discussions of the needed resources and impacts of employing this kind of safety measures. This included capital cost, recurring cost and many aspects of the associated side effects, which covered loss of production, environmental impacts, and ability to intensify existing risks or even trigger new accident scenarios. A detailed application is provided to illustrate the specificity and the outcomes of each involved step.

**Keywords** Industrial safety, Safety systems, Many-objective optimization, Uncertainty analysis, robustness assessment, Scenario discovery.