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Systematic risk assessment methodology for critical infrastructure elements - Oil and Gas subsectors

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The concern for the protection of critical infrastructure has been rapidly growing in the last few years in Europe. The level of knowledge and preparedness in this field is beginning to develop in a lawfully organized manner, for the identification and designation of critical infrastructure elements of national and European interest. Oil and gas production, refining, treatment, storage and transmission by pipelines facilities, are considered European critical infrastructure sectors, as per Annex I of the Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection. Besides identifying European and national critical infrastructure elements, member states also need to perform a risk analysis for these infrastructure items, as stated in Annex II of the above mentioned Directive.

In the field of risk assessment, there are a series of acknowledged and successfully used methods in the world, but not all hazard identification and assessment methods and techniques are suitable for a given site, situation, or type of hazard. As Theoharidou, M. et al. noted (Theoharidou, M., P. Kotzanikolaou, and D. Gritzalis 2009. Risk-Based Criticality Analysis. In Critical Infrastructure Protection III. Proceedings. Third Annual IFIP WG 11.10 International Conference on Critical Infrastructure Protection. Hanover, New Hampshire, USA, March 23–25, 2009: revised selected papers, edited by C. Palmer and S. Shenoi, 35–49. Berlin: Springer.), despite the wealth of knowledge already created, there is a need for simple, feasible, and standardized criticality analyses.

The proposed systematic risk assessment methodology includes three basic steps: the first step (preliminary analysis) includes the identification of hazards (including possible natural hazards) for each installation/section within a given site, followed by a criterial analysis and then a detailed analysis step. The criterial evaluation is used as a ranking system in order to establish the priorities for the detailed risk assessment. This criterial analysis stage is necessary because the total number of installations and sections on a site can be quite large. As not all installations and sections on a site contribute significantly to the risk of a major accident occurring, it is not efficient to include all installations and sections in the detailed risk assessment, which can be time and resource consuming. The selected installations are then taken into consideration in the detailed risk assessment, which is the third step of the systematic risk assessment methodology. Following this step, conclusions can be drawn related to the overall risk characteristics of the site.

The proposed methodology can as such be successfully applied to the assessment of risk related to critical infrastructure elements falling under the energy sector of Critical Infrastructure, mainly the sub-sectors oil and gas.

Key words: Systematic risk assessment, criterial analysis, energy sector critical infrastructure elements