PAPER REF: 3860

A SELECTION SYSTEM OF BRAZILIAN NUCLEAR SITES BASED ON EPRI SITING GUIDE MODEL USING FUZZY LOGIC: AN EXPLORATORY EXERCISE IN RELIABILITY ENGINEERING

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ABSTRACT

This article aims to exercise an application of fuzzy logic, supporting the Selection Process of Nuclear Sites established by the concepts and criteria of the Electric Power Research Institute EPRI-Siting Guide. This model proposes the use of a decision tree with 4 major phases, involving exclusion and avoidance criteria which from a region of interest in phases 1 and 2, produces candidate areas, and potential sites. In phases 3 and 4 with of suitability criteria, comparison, and utility functions, determines what excellent site for development of a plant nuclear. A Fuzzy Logic appears as a powerful tool to solve problems with a variety of applications in this type of decision. This article provides a systemic approach, using fuzzy logic to integrate the various dimensions of intervention, describing the concepts of an integrated system for assessment, represented by Fuzzy Maps, seeking to maximize the results to stakeholders, and minimize adverse impacts to the host community and the society. Finally, the procedure for choosing the location of the nuclear site must have a philosophy, providing impartial and reasonable results for a neutral observer..

Keywords: fuzzy logic, nuclear industry, nuclear sites, systems evaluation and selection systems, multicriteria decision support.

INTRODUCTION

The volatility of fossil fuel prices and growing concern for global warming are leading to a "nuclear renaissance" around the world, even with the Fukushima accident. Construction activities are in process plants in 12 countries, and plans to develop new power plants in the U.S. are coming closer to commercialization than they were in almost 30 years. A recent report of the "Intergovernmental Panel on Climate Change" refers nuclear energy as a key mitigation technology for the treatment of the greenhouse effect.

EPRI-Electric Power Research Institute, also carefully examined the options for mitigating climate change. As the request of its board of directors, the EPRI examined the technical possibilities for reducing carbon dioxide (CO2) in the United States in the segment of production of Electricity. The EPRI-Electric Power Research Institute found that there is no a technology that solves the problem by itself, but within the portfolio of technologies required to significantly reduce impacts on climate, nuclear power appears as an opportunity. According to EPRI's analysis, a significant nuclear expansion required for the United States, 64 gigawatts of new capacity by 2030 could prevent the emission of approximately 260

million tons of CO2 annually by the power sector in EUA.A global expansion of nuclear energy, is estimated to be about five to ten times more in gigawatts, and should produce proportionally larger reductions in CO2 emissions (CLAMP, EPRI Journal, Summer, 2007)

"The Future Of Nuclear Power - An Interdisciplinary MIT Study" is a study by the Massachusetts Institute of Technology in 2003, which estimates that by 2050 there are between 1,000 and 1,500 new nuclear power plants of 1000 Mwe in the world.

The nuclear competitiveness increases according the concerns about climate change continue to expand (Atalla,, 2009). In Brazil, we look forward to growing its nuclear generating capacity through construction of new nuclear plants. It is estimated that between 17 and 34 plants of 1000 Mwe by 2050 (30-Eletronuclear PNE-Brazilian Energy Plan for 2030).

Inside this reality, we understand that the process of locating these sites should seek the greatest possible transparency to civil society, as well as the appropriate technical parameters for the optimal choice be done and meet all the stakeholders.

RESULTS AND CONCLUSIONS

The use of Fuzzy Logic facilitates this type of systemic context, dynamic and flexible required, and confirms it as a tool to support to these situations in ambient of uncertainty, mutability, and high reciprocal interference.

The decision process of development of nuclear power includes site selection, technology selection, economic structure, project finance, construction and operation. So have a selection process for accurate and appropriate for technology selection, also using fuzzy logic, presents itself as an opportunity to also contribute to the mitigation of risks of the venture.

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