MANAGING ECONOMIC RISKS DUE TO ELECTRICAL EQUIPMENT CONTAINING PCBS:

ANALYTICAL TOOLS TO SUPPORT UTILITY DECISIONS

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ABSTRACT

For industries that make use of hazardous materials, the direct economic consequences of alternative courses of action are often the most important factors in decisions about how to manage risks, but may be difficult to predict. The analysis of alternatives can be very complex, and uncertainty about actual and perceived risks may impede company efforts to manage risks. A mathematical model designed to assist electric utility personnel in the financial analysis of management options for PCB-containing equipment has been developed and implemented as an interactive software tool. Based on the methods of decision analysis and utility finance, this specific application allows the user to represent uncertainty about possible PCB incidents (fires or spills), including frequency of occurrence, incident severity, and the costs of cleanup, plant shutdown, and legal liabilities. Predictions of total life-cycle equipment and incident costs can be compared for utility ratepayers and shareholders in order to facilitate risk management decisions. While the approach is general enough to be useful for many types of hazardous materials, this paper presents a PCB transformer risk management case study using this tool.

KEY WORDS: Risk management, Risk analysis, PCB, Software, Utility, Decision, Model, Transformer

The PCB Economic Risk Management Model (ASK) and the Contaminated Oil Economic Risk Management Model (COIL) are decision support tools designed to help utility personnel manage equipment containing or contaminated with PCBs. Based on the methodology of decision analysis, the models provide techniques for comparing alternative strategies in terms of equipment costs and the costs of potential incidents such as fires and spills.

INTRODUCTION

Electric utilities typically have a variety of equipment containing or contaminated with PCBs. Accidents or failures involving such equipment may lead to very large economic costs for the utility. These costs can include cleanup of the facility and the surrounding area, repair or replacement of utility and third-party equipment, and possible legal liabilities. The possibility of incurring such losses may exist even when
the PCB contamination is very low. The need to weigh these highly uncertain but potentially large losses against the costs of various management alternatives prompted the development of the two decision support tools discussed in this paper. The development of ASK was motivated by the need to manage askarel transformers and PCB capacitors in the face of the potential for large financial impacts due to incidents such as fires. COIL was developed to help utilities choose management alternatives for potentially contaminated mineral oil equipment. Both tools focus on economic risks, which include direct equipment and cleanup costs, and costs that may be incurred due to real or perceived health or environmental effects from releases of PCBs.

Management Alternatives

Utilities have a variety of options available to manage equipment containing PCBs, including replacing existing equipment with one or more alternative types of equipment, isolating the equipment or installing electrical protection devices to reduce risks, retrofilling to reduce PCB levels, or retaining the existing equipment as is. Replacement may involve significant costs for a new unit and for installation, but may improve the operating efficiency and will eliminate the possibility of a PCB incident. Incidents involving substitute equipment may occur with greater frequency and with greater risk of conventional damage, but probably will not lead to the larger costs sometimes associated with PCB incidents.

There is often considerable uncertainty regarding the degree of PCB contamination of mineral oil transformers. Testing the equipment can help guide the choice of a management strategy and may help a utility avoid the costs associated with an incident involving PCBs. If the likelihood of severe contamination is low and incidents are rare, however, the cost of testing may exceed the value of the information gained.

Balancing Equipment Costs Against Economic Risks

Choosing the best management strategy requires careful weighing of uncertain losses against known cost and performance considerations. Is an investment in risk reduction measures or new equipment merited to remove the possibility of a potentially very expensive but relatively unlikely incident? Management questions such as these are challenging due to the large uncertainties in the likelihood, severity, and cost of incidents, as well as the complexity of the cost, performance, and financial considerations.

For example, consider the case of a utility that has a number of askarel transformers in its generating stations. There is a small chance that a fault in one of the transformers could lead to a major fire, one in which PCBs and combustion by-products would be distributed widely through the plant in the form of smoke and soot. How large would the probability of a major fire need to be, and how great would the likely costs of an incident need to be, before the company should decide to remove its askarel transformers and replace them with non-PCB equipment? The cost of installing new equipment is relatively easy to determine, but the potential incident costs are not. Utility personnel may find it difficult to estimate the costs since incidents are unlikely and the costs could be quite large. The challenges posed by decisions such as this have motivated the development of the risk management models and decision support tools described in this paper.