

Task No. 1

Please solve the below case study using Sequential Decision Tree technique. Send your solutions to my email address (skapa@econ.muni.cz) .

R. Skapa

<http://www.prenhall.com/divisions/bp/app/russellcd/PROTECT/CHAPTERS/CHAP02S/C02S01.HTM>

CASE PROBLEM 2S.1

Transformer Replacement at Mountain States Electric Service

Mountain States Electric Service is an electrical utility company serving several states in the Rocky Mountain region. It is considering replacing some of its equipment at a generating substation and is attempting to decide whether it should replace an older, existing PCB transformer. (PCB is a toxic chemical known formally as polychlorinated biphenyl.) Even though the PCB generator meets all current regulations, if an incident occurred, such as a fire, and PCB contamination caused harm either to neighboring businesses or farms or to the environment, the company would be liable for damages. Recent court cases have shown that simply meeting utility regulations does not relieve a utility of liability if an incident causes harm to others. Also, courts have been awarding large damages to individuals and businesses harmed by hazardous incidents.

If the utility replaces the PCB transformer, no PCB incidents will occur, and the only cost will be that of the transformer, \$85,000. Alternatively, if the company decides to keep the existing PCB transformer, then management estimates there is a 50-50 chance of there being a high likelihood of an incident or a low likelihood of an incident. For the case in which there is a high likelihood that an incident will occur, there is a .004 probability that a fire will occur sometime during the remaining life of the transformer and a .996 probability that no fire will occur. If a fire occurs, there is a .20 probability that it will be bad and the utility will incur a very high cost of approximately \$90 million for the cleanup, whereas there is a .80 probability that the fire will be minor and a cleanup can be accomplished at a low cost of approximately \$8 million. If no fire occurs, then no cleanup costs will occur. For the case in which there is a low likelihood of an incident occurring, there is a .001 probability that a fire will occur during the life of the existing transformer and a .999 probability that a fire will not occur. If a fire does occur, then the same probabilities exist for the incidence of high and low cleanup costs, as well as the same cleanup costs, as indicated for the previous case. Similarly, if no fire occurs, there is no cleanup cost.

Perform a decision tree analysis of this problem for Mountain States Electric Service and indicate the recommended solution. Is this the decision you believe the company should make? Explain your reasons.¹

¹ This case was adapted from W. Balson, J. Welsh, and D. Wilson, "Using Decision Analysis and Risk Analysis to Manage Utility Environmental Risk," *Interfaces* 22, no. 6 (November-December 1992): 126-39.